VOLUME 41 NUMBER 1 JANUARY, 1956

AMERICAN JOURNAL
OF
OPHTHALMOLOGY

THIRD SERIES FOUNDED BY EDWARD JACKSON

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DEPARTMENTS

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Publication office: 450 Ahnaip St., Menasha, Wisconsin

Subscription price in United States twelve dollars yearly. In Canada and foreign countries fourteen dollars. Published monthly by the Ophthalmic Publishing Company. Subscription and Advertising Office: 664 North Michigan Avenue, Chicago 11, Illinois. Entered as second class matter at the post office at Menasha, Wisconsin. Printed in U.S.A.

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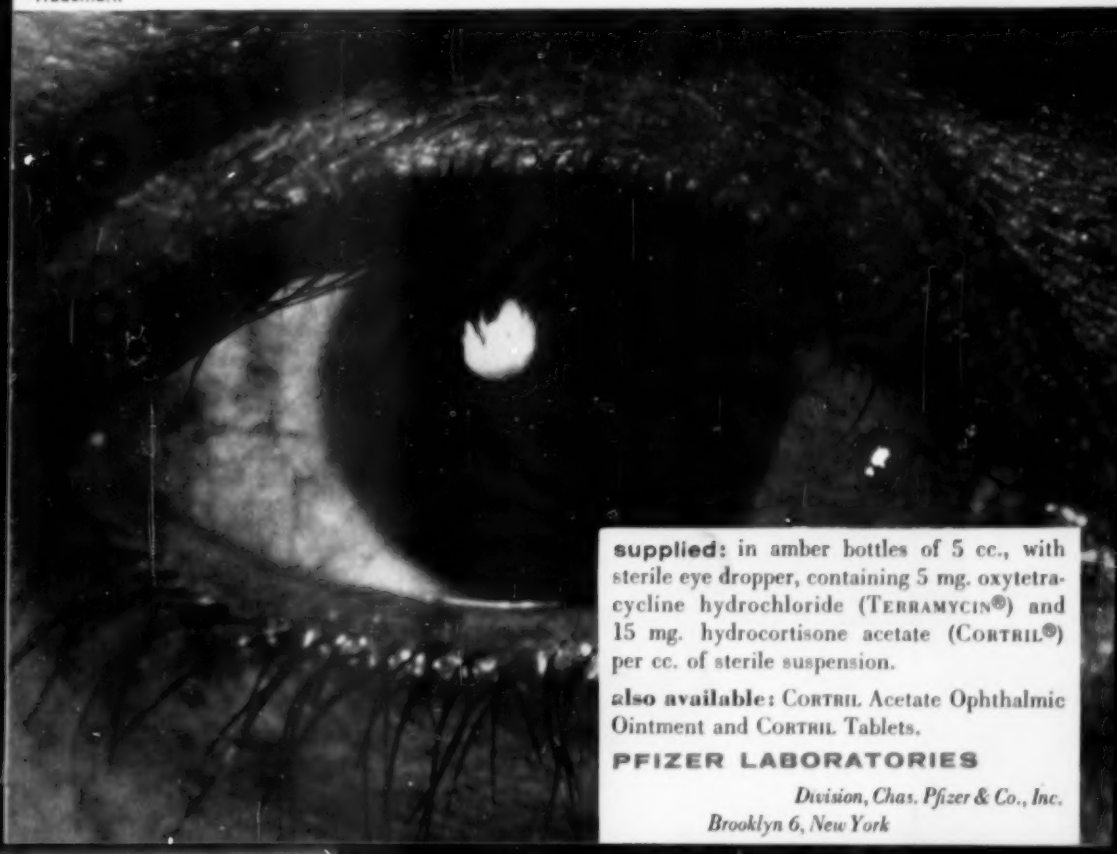

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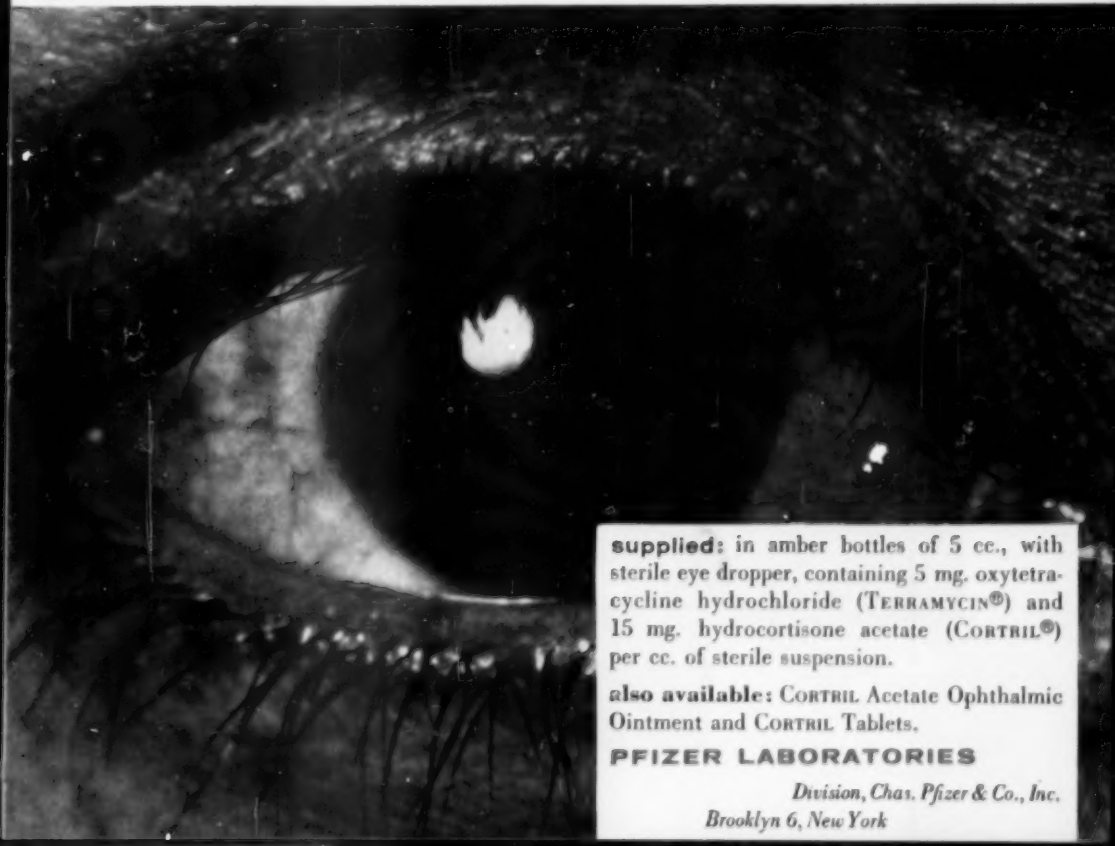

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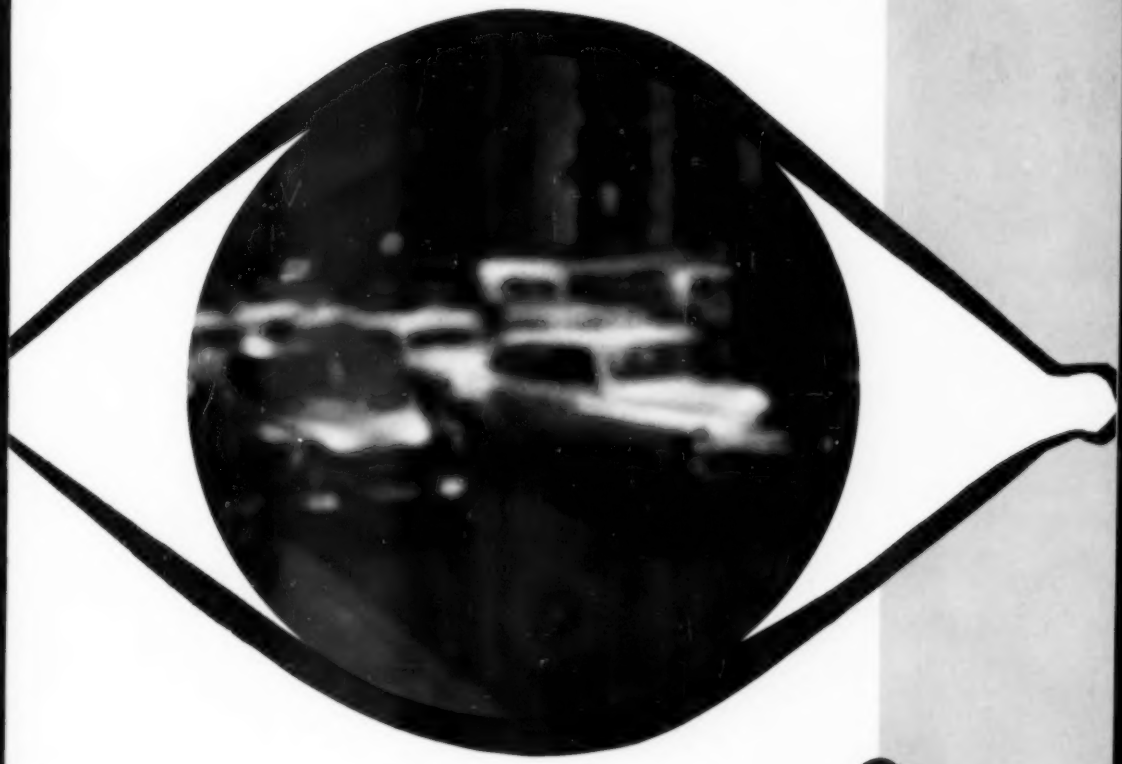

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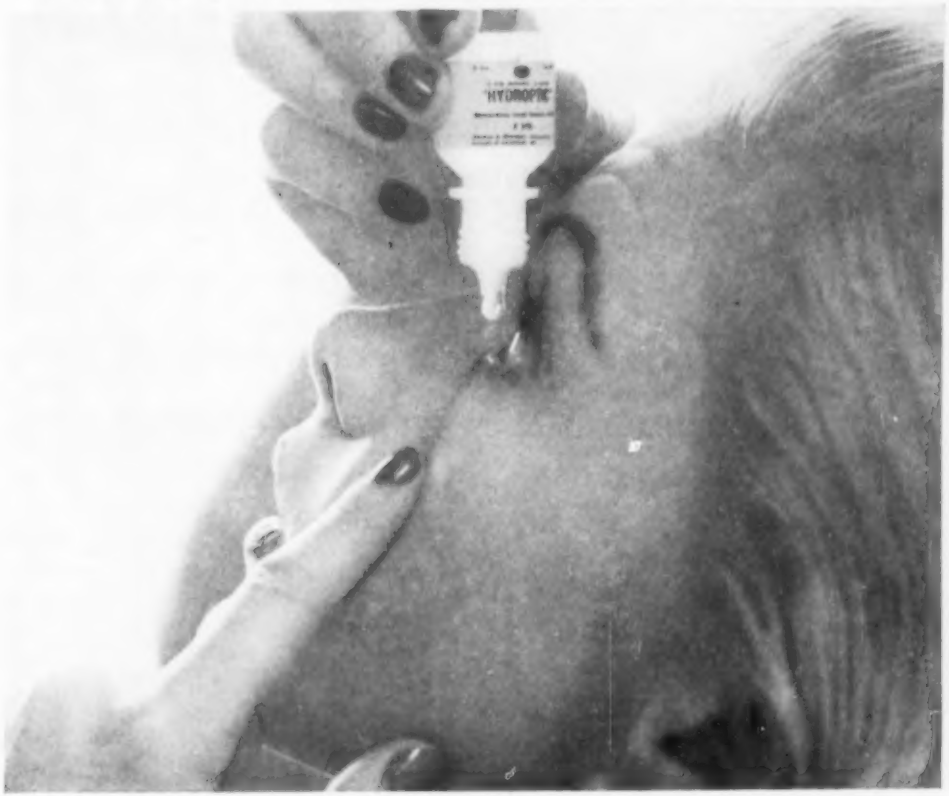

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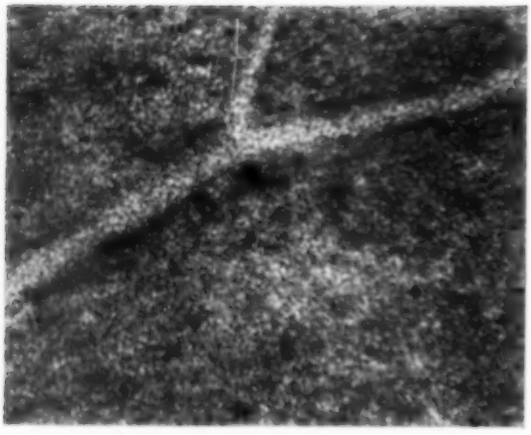

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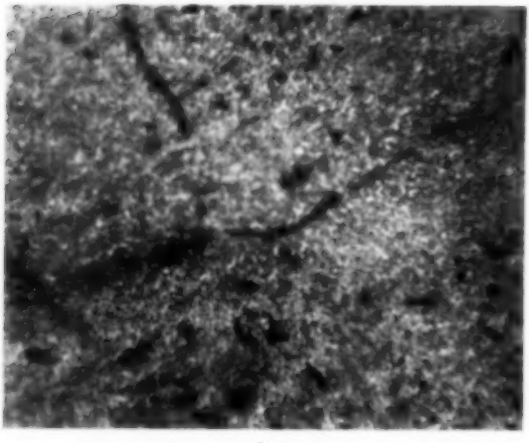

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Fig. 1 (Kearns). Retinas stained with Sudan IV and counterstained with hematoxylin. a. Patient without fat embolism. b. Patient with fat embolism.

AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 41 JANUARY, 1956 NUMBER 1

FAT EMBOLISM OF THE RETINA

DEMONSTRATED BY A FLAT RETINAL PREPARATION

THOMAS P. KEARNS, M.D.*
Rochester, Minnesota

There appears to be no question that fat embolism of the eye, just as of other tissues, may follow extensive trauma in which long bones are fractured. There does seem to be a question as to whether the retinopathy of ocular fat embolism and Purtscher's traumatic retinal angiopathy are the same. Numerous articles on these subjects have appeared, and the reader is referred to those by Bedell,[1] Spaeth,[2] Fritz and Hogan,[3] DeVoe,[4] and Wagener[5] for comprehensive coverage of the subjects and the bibliography.

It is not the purpose of this paper to prove or disprove that Purtscher's retinopathy and the retinopathy of fat embolism are the same. However, as will be seen, a retinopathy not unlike that described by Purtscher developed in the case of fat embolism to be presented. Generalized fat embolism was suspected on the basis of the patient's clinical course, and the retinopathy was thought compatible with this diagnosis.

After necropsy, microscopic evidence of generalized fat embolism was found and a technique of flat retinal preparation was used to confirm the presence of fat in the retinal vessels. No report of a similar technique could be found in the recent literature. However, no claim for originality can be made, since Hosch[6] in 1906 reported demonstrating fat in the retinal capillaries by a technique of flat retinal preparation. Hosch's specimen was obtained in 1882, but he did not realize its full significance until later and was prompted to publish his report.

REPORT OF CASE

History. A 22-year-old white man in good health, while standing behind his stalled pickup truck on April 22, 1954, was struck by another automobile and apparently was crushed between the two vehicles. He was admitted to a Rochester hospital in severe shock with obvious femoral fractures, confusion, and restlessness. Examination revealed multiple fractures of the pelvis with transection of the urethra, a fracture of the sacrum, and fractures of the fifth lumbar vertebra, the midshaft of both femurs, and the midshaft of the left tibia and fibula (compounded).

The patient remained comatose. The fractures were immobilized and supportive therapy was begun. Although the blood pressure responded to therapy, the patient never fully regained consciousness and the possibility of cerebral fat embolism was suspected. The following day ophthalmologic consultation was requested to determine if any evidence of fat embolism could be found by ophthalmoscopy.

Eye examination. The pupils were equal and responded promptly to light. Hydroxyamphetamine (Paredrine) was instilled to permit adequate examination of the fundi. The discs were normal but scattered over both retinas there were large fluffy white

* From the Section of Ophthalmology, Mayo Clinic and Mayo Foundation. The Mayo Foundation, Rochester, Minnesota, is a part of the Graduate School of the University of Minnesota.

patches that appeared to be localized areas of edema. These patches varied in size, the majority being about the size of the optic-nerve head. The smaller ones had the appearance of fresh cotton-wool patches seen so frequently in other types of retinopathy. In the macular areas the patches became more or less confluent, which produced the appearance of a cherry-red spot at the foveas. There were no major retinal hemorrhages, although several small streak hemorrhages were identified in each retina. The vessels were normal in appearance except where they were partially obscured by the edema. This picture of the fundus was thought compatible with a diagnosis of fat embolism.

The following day the concentration of blood urea rose to 162 mg. per 100 cc. and the temperature to 103°F. while the urinary output declined markedly. The coma deepened and the patient died on April 25, 1954.

At necropsy, multiple petechial hemorrhages were found in the lungs, pericardium, liver, spleen, kidneys, testes, spinal cord, and brain. On microscopic examination the presence of fat, both in capillaries and as free droplets, was demonstrated by the Sudan IV stain in all of these tissues.

The posterior segments of both globes were removed by the transfrontal approach and, after fixation in formalin, the retinas were dissected free and spread flat on a glass slide. They were stained first with Sudan IV and then counterstained with hematoxylin. They were mounted with Mallory's mounting solution and the edges of the cover glass were sealed with Duco cement.

As can be seen in Figure 1, the thickness of the specimens prevents evaluation of much cellular detail but the retinal vessels are easily distinguished. Many of the retinal vessels of the patient with fat embolism contained fat (fig. 1*b*), and the brilliant reddish-orange staining against an over-all blue background presented a striking appearance.

The retina is the only tissue in the body that lends itself to this method of examination. The two-dimensional character of the retina and its vascular supply is ideally adapted to this type of demonstration of the presence and extent of fat embolism. By such a method one does not have to rely on serial sections to demonstrate the fat, and the possibility of extraneous fat as an artefact is eliminated. By use of only the peripheral part of the retina for this purpose, the central section along with the optic nerve can be prepared in the usual manner if so desired.

Summary

A case of systemic fat embolism due to trauma is presented in which a retinopathy similar to Purtscher's traumatic retinal angiopathy appeared. The retinopathy was thought clinically to be the result of ocular fat embolism, and, at necropsy, fat embolism of the retina was demonstrated by a technique of flat retinal preparation.

Mayo Clinic.

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THE TREATMENT OF EXPANDING LESIONS OF THE ORBIT*

With particular regard to those arising in the lacrimal gland

The Seventh Arthur J. Bedell Lecture

Algernon B. Reese, M.D.
New York, New York

Someone once said that taffy is better than epitaphy. By the same token it is well to have a lectureship honor the living rather than the dead. To this end I consider it a great privilege to accept your gracious invitation to deliver this Arthur J. Bedell Lecture. I view Dr. Bedell as possessing to an exceptional degree scientific integrity, forthrightness, and the courage of his convictions. By keeping us in line he has had a salutary effect on our deliberations. As I view the horizon I cannot see his counterpart.

As you know, Dr. Bedell is also frequently filled with righteous indignation. So am I at the moment about my subject this morning and I shall now give vent to it.

It is my conviction that expanding lesions of the orbit, and particularly those arising in the lacrimal gland, are more poorly treated than any other group of cases that we encounter in ophthalmology. I have been eager, therefore, to try to rectify this in some measure by evolving some work plan. I shall pass this on to you in the hope that it will be of some value. I first wish to speak of primary intraorbital tumors and simulating lesions in general and then give special attention to those arising in the lacrimal gland.

Ninety percent of such lesions primary in the orbit can be reduced to a relatively small list. This will exclude lesions which arise from the sinuses or nasopharynx and extend secondarily into the orbit, such as mucocele, malignant tumors, and so forth. Also excluded are metastatic neoplasms, such as neuroblastoma primary in the suprarenal gland, or other types of cancer which have their primary sites elsewhere. Moreover, there is such a great variety of tumors and simulating lesions that affect the orbit primarily that all of these cannot be covered and I have, therefore, eliminated such rare and straggling cases as rhabdomyosarcoma, leiomyosarcoma, eosinophilic granuloma, myoblastoma, and so forth. My remarks will be confined to the following group which comprises more than 90 percent of the primary tumors and tumorlike lesions of the orbit which have been encountered in the Eye Institute. They are, in the order of frequency, hemangioma, lymphomatous tumors (lymphoma, lymphosarcoma), chronic granuloma (pseudotumor), dermoid cyst, epithelial tumors of the lacrimal gland, peripheral-nerve tumors (neurofibroma, neurilemoma), meningioma, and astrocytoma (glioma). It can be seen by scanning this list that the treatment depends entirely on the diagnosis.

Hemangiomas are well encapsulated, lie in loose areolar tissue, and can be actually shelled out easily by blunt dissection. A peculiar fact is that no apparent afferent vessel is encountered so that the removal is entirely without hemorrhage. Why such lesions have no demonstrable afferent vessel is difficult to explain. The Krönlein operation is indicated for the removal of these tumors and the results are highly satisfactory.

Lymphomatous tumors are poorly demarcated, nonencapsulated, and friable. Removal of the lesion by surgery is not necessary. After the diagnosis has been established the orbit is treated by irradiation and the response is truly dramatic.

In the case of the chronic granuloma, or so-called "pseudotumor," surgery is not in-

* Presented at the seventh annual clinical conference of the Staff and Ex-Residents of Wills Eye Hospital, Philadelphia, Pennsylvania, February 19, 1955. From the Institute of Ophthalmology of the Presbyterian Hospital, New York, New York.

dicated except insofar as it is necessary to establish the diagnosis. These lesions can simulate, faithfully, a tumor and frequently tissue for biopsy purposes is necessary. Removal of this tissue, though, is not entirely without some hazard because the lesion frequently is quite vascular and hemorrhage may occur when the lesion is deep and becomes encapsulated and, therefore, adds to the exophthalmos to the point where exposure of the cornea may be imminent. After the diagnosis has been established and the lesion is not a true neoplasm then temporizing is in order. Sometimes irradiation is an effective treatment, particularly when the lymphocytic element is great.

Dermoid cysts are frequently superficially located around the orbital margin and attached to the bone. Their excision can be accomplished by an incision through the skin directly over the lesion. When such cysts are deep, though, and arise from the diploe of bone, the Krönlein operation must be done. If the entire cyst cannot be removed then that part of the wall which remains should be cauterized with carbolic acid and neutralized with alcohol. Following this all, or as much as possible, of the eschar should be excised. Rarely, these cysts are deep and extend into the cranial cavity as an hourglass-shaped lesion. In such instances the neurosurgeon should take over.

The epithelial tumors of the lacrimal gland are discussed fully later.

Tumors of the peripheral nerves may be a neurilemoma or a neurofibroma. In the case of the neurilemoma the tumor is characteristically well encapsulated and can be shelled out by blunt dissection easily in the same manner that the hemangiomas can. Therefore, the Krönlein operation is indicated.

The neurofibroma of the orbit is a diffuse lesion and is frequently a systemic manifestation. It is difficult to lay down any thumbnail plan of treatment in these cases. When this lesion appears in the orbit it usually invades the contiguous bone and frequently reaches the cranial cavity and other vital areas. As the process is a steadily progressive one it is probably advisable to do an exenteration at the earliest possible time.

The meningiomas which characteristically occur primarily outside of the orbit but first manifest themselves in the orbit as an exophthalmos grow so slowly that sometimes merely temporizing is in order. It is not at all infrequent for these tumors to take 20 to 30 years to grow to an appreciable size where function is jeopardized. As the tumor is usually primary in the cranial cavity this lesion falls, essentially, in the bailiwick of the neurosurgeon.

The astrocytoma or glioma of the optic nerve can be removed very satisfactorily by the Krönlein operation.

We can deduce, therefore, a general principle which is that the treatment cannot be outlined until the diagnosis is established. This predisposes, in many cases, the removal of tissue for biopsy. Those who are well versed in cancer work feel that the removal of tissue for biopsy does not jeopardize the prognosis. Therefore, no hesitancy should be felt in obtaining biopsy material when indicated. The only possible exception to this is in cases where the lesion is encapsulated and in our cases this would concern the epithelial tumors of the lacrimal gland which will be discussed later. I do not mean to imply that an inviolate rule is that biopsy material must always be taken. There are instances when the lesion is well encapsulated and accessible, and an excision can be done without a biopsy. There are other instances when the diagnosis is clear without the necessity of a biopsy.

Patients harboring primary expanding lesions of the orbit present themselves to the ophthalmologists as a variety of problems. These can be enumerated as follows:

1. Exophthalmos with a palpable mass

a. The mass is well demarcated and apparently encapsulated. In such cases a Krönlein operation is usually indicated. It may be advisable to explore the orbit and appraise

the lesion before electing to do the Krönlein operation. This can be done satisfactorily by performing a wide canthotomy and severing the external canthal ligament. This permits the entrance of the index finger into the orbit for palpation. The Krönlein operation can be carried out by merely extending the canthotomy incision. Such an exploration may lead one to elect to remove some tissue for biopsy before determining the next step.

b. A deep, rather indistinct, mass or resistance is palpable. In these cases the exploration through a canthotomy should be employed first. This procedure permits palpation of the orbit, and if the lesion, although deep, is encapsulated and well localized, the Krönlein operation can then be carried out. If palpation indicates that the lesion does not lend itself to excision, at least tissue for biopsy can be removed.

2. Exophthalmos with no palpable mass

a. Pressure on the optic nerve causes atrophy or papilledema, or at least some dysfunction of the nerve. In such cases the exploration through a canthotomy is usually indicated and this permits palpation of the orbit. If a localized mass is encountered the Krönlein operation can then be done by extending the canthotomy incision.

b. There may be indentation of the sclera as indicated by retinal striae. This is an accurate localizing sign and justifies proceeding with the Krönlein operation for removal of a tumor localized in the orbit where indicated by the area of retinal striae.

c. No positive finding. The innumerable non-neoplastic lesions which can give a unilateral proptosis must be considered. When X-ray films show an increase in soft tissue density and/or the results of increased orbital pressure, the presence of some type of neoplasm must be seriously suspected although there are non-neoplastic conditions which give rise to such findings. When the findings are negative except for dysfunction of one or more extraocular muscles we must remember that paralysis of one of the rectus muscles alone is capable of producing an exophthalmos of as much as two millimeters. If there is a proptosing lesion in the presence of a dysfunction of a rectus muscle, the ensuing proptosis is in its extent out of proportion to the size and extent of the offending lesion. In all of these cases with no positive findings, or at least with indeterminate findings, a course of watchful temporizing is in order.

The point which should be emphasized in handling orbital lesions is that the indicated therapy cannot be stated in most instances until the diagnosis is established. There is a great variety of lesions encountered and thus a great variety of indicated therapy. The therapy is almost always contingent on the diagnosis. The only exception is the instance where the indications point to a well localized encapsulated lesion which can be removed satisfactorily by surgery.

Expanding lesions arising in the lacrimal gland are discussed separately because they present a special problem in treatment. Our therapeutic approach to these lesions especially is crying for revision.

The various lesions which arise from the lacrimal gland, or at least in the lacrimal gland fossa, are listed in Table 1. These are all consecutive cases encountered at the Eye Institute and confirmed by microscopic sections. Clinically, all of these lesions are manifested as a well-demarcated, localized, firm mass palpable through the upper lid in the region of the lacrimal gland. They are closely associated with the contiguous bone and sometimes it is difficult to palpate the demarcation between the orbital margin and the lesion. I know of no way by which a correct clinical diagnosis can be made short of biopsy material.

In Table 1 it is surprising that chronic granulomas are the commonest cause of expanding lesions in the lacrimal gland fossa. This process is similar to the well-known chronic granulomas of the orbit frequently spoken of as pseudotumors. The fact that such a lesion can be confined so frequently

TABLE 1

INCIDENCE OF EXPANDING LESIONS OF THE LACRIMAL GLAND BASED ON 112 CONSECUTIVE CASES

Granuloma		35 (31%)
Nonspecific dacryoadenitis	26	
Sarcoid	5	
Hodgkin's disease	4	
Carcinoma		27 (24%)
Mixed tumor		25 (22%)
Lymphosarcoma*		24 (21%)
Adenoma		2 (2.0%)
Total		112

* It did not seem necessary to divide the lesions listed as lymphosarcoma into reticulum cell, lymphocytic cell, and giant follicle types. Also, lymphomas are included because the demarcation between them and lymphosarcoma is not always clear.

to the region of the lacrimal gland has not, I believe, been pointed out before. In the table, under the heading "Carcinoma," I have not broken down the group into various types (adenoid cystic "cylindroma," squamous, mucoepidermoid, those arising from mixed tumors, and so forth), for it did not seem necessary for our purposes here. The adenoid cystic type of carcinoma was by far the commonest one. The term "mixed tumor" refers to the tumor which has the benign cytology but malignant behavior based on the fact that seeding may occur,* invasion of or extension through the capsule and spread into the adjacent bone as well as recurrence and eventually carcinoma if incompletely removed. If such a tumor develops a malignant cytology it has been grouped with the carcinomas. I have also listed two adenomas and whether these are true adenomas, or normal or ectopic lacrimal glands, I cannot say.

By analyzing Table 1, it can be seen that of the expanding lesions in the lacrimal gland fossa approximately one third are non-neoplastic. Two thirds are neoplastic but 30 percent of these (lymphosarcoma) are non-surgical problems after the diagnosis has been established. Therefore, of these lesions arising in the lacrimal fossa only about one half require surgical removal. Approximately 50 percent of those presenting a surgical problem are benign cytologically and 50 percent are malignant.

Foote and Frazell[1] have recently published an excellent monograph on salivary gland tumors. I think it is an incontestable premise that the tumors found in the salivary glands have their exact counterpart in the lacrimal gland. From a total of 873 cases reported by Foote and Frazell their incidences are shown in Table 2.

All of the salivary gland tumors listed in Table 2 have been identified in the lacrimal gland except the acini cell adenocarcinoma and Warthin's tumor. Perhaps the former has its counterpart in the lacrimal gland but not the latter.

The incidence of the epithelial tumors of the salivary gland shown in Table 2 seems to roughly parallel the epithelial tumors of the lacrimal gland except that the adenoid cystic (cylindroma) type of adenocarcinoma seems to be more common in the lacrimal gland than in the major salivary glands.

If, in Table 2, one groups all of the malignant epithelial tumors under the general heading "carcinoma" it can be seen that ap-

TABLE 2

INCIDENCE OF SALIVARY GLAND TUMORS BASED ON FOOTE AND FRAZELL'S CLASSIFICATION OF 873 CASES

Mixed Tumor		63%
Benign	56.5%	
Malignant	6.5%	
Muco-epidermoid		11%
Adenocarcinoma		11%
Adenoid cystic		
Acinic-cell		
Miscellaneous		
Warthin's tumor (papillary cystadenoma lymphomatosum)		6.0%
Squamous carcinoma		4.5%
Unclassified (mostly malignant)		4.5%

* Mixed tumors with benign histologic characteristics may be very friable. When the capsule is opened to obtain tissue for biopsy, this friable nature suggests a malignant growth. In spite of the benign cytology an exenteration in such cases is usually indicated because these tumors may not be well localized with a definite capsule and often cannot be locally excised without disseminating tumor cells in the surrounding orbital tissue.

proximately 50 percent are benign and 50 percent are malignant, the same precentage mentioned for the comparable tumors in the lacrimal gland.

From our available cases, and from the composite group of those in the literature, I find the incidence of epithelial tumors of the lacrimal gland to be approximately as follows:

	Percent
Benign mixed	43
Adenoid cystic (cylindroma)	38
Carcinoma (indeterminate)	11
Malignant mixed	4
Mucoepidermoid	4

Assuming that the tumors of the salivary glands are comparable to those seen in the lacrimal gland, we find a most striking difference in the cure rate of the same type of tumor in the two different sites. The prognosis of salivary gland tumors is good and that of lacrimal gland tumors extremely poor. Foote and Frazell[1] found that 96 percent of their mixed tumors treated primarily at the Memorial Center for Cancer and Allied Diseases showed no recurrence for from five to 15 years after surgery. Of their cases of carcinoma followed five or more years, and treated from the beginning at the Memorial Center, from 25 to 30 percent showed no recurrence. In marked contrast to these figures on epithelial tumors of the salivary glands are those available for the same tumor in the lacrimal gland. Combining our cases with those reported by Sanders,[2] Davies,[3] Forrest,[4] and Benedict,[5] I find that only 50 percent of the patients with mixed tumor of the lacrimal gland were free of disease and living five years or more. Of the carcinomas followed five years or longer, all were dead except one, and recurrence was evident in this patient. We can only conclude, therefore, that our treatment of these patients leaves much to be desired, and if we compare the cure rate of epithelial tumors of the lacrimal gland with comparable tumors elsewhere, it is not too strong to say that we have been derelict.

By looking over the list of expanding lesions of the lacrimal gland as listed in Table 1, it can be seen that the proper treatment depends entirely on the proper diagnosis. If the correct diagnosis is a mixed tumor then the indicated treatment is local excision. If the diagnosis is carcinoma, then it is exenteration; if the diagnosis is lymphosarcoma, it is irradiation; and if the diagnosis is chronic granuloma, it is in order to temporize because we know that such lesions may show spontaneous regression.

The reasons for our failure to treat effectively epithelial tumors of the lacrimal gland seem to be the following:

1. *Usually the correct diagnosis is not known* when treatment is attempted. The irrationality of deciding on the treatment without knowing the correct diagnosis is in keeping with the same principle set down for expanding lesions of the orbit in general.

2. *The epithelial tumors of the lacrimal gland* (both mixed and carcinoma) have four characteristics which must be taken into consideration in carrying out surgery. These are:

a. The tendency of the tumor to invade and even extend beyond its capsule, or, for the capsule to be missing in places. Therefore, the tumor should not be shelled out of its capsule but the capsule should be removed with the tumor.

b. The tendency of the tumor to seed.* Therefore, every precaution should be taken against this possibility.

c. The tendency of the tumor to invade bone. The one important difference between these tumors as they affect the salivary gland in contrast to the lacrimal gland is their proximity to bone. In the lacrimal gland fossa the tumor lies directly adjacent to bone and,

* Foote and Frazell from their very large series of salivary gland tumors state that primarily mixed tumors are always unilobular and recurrent manifestations always multilobular with discrete nodules sometimes quite far separated. This multilobular character of recurrent tumors is attributed to seeding.

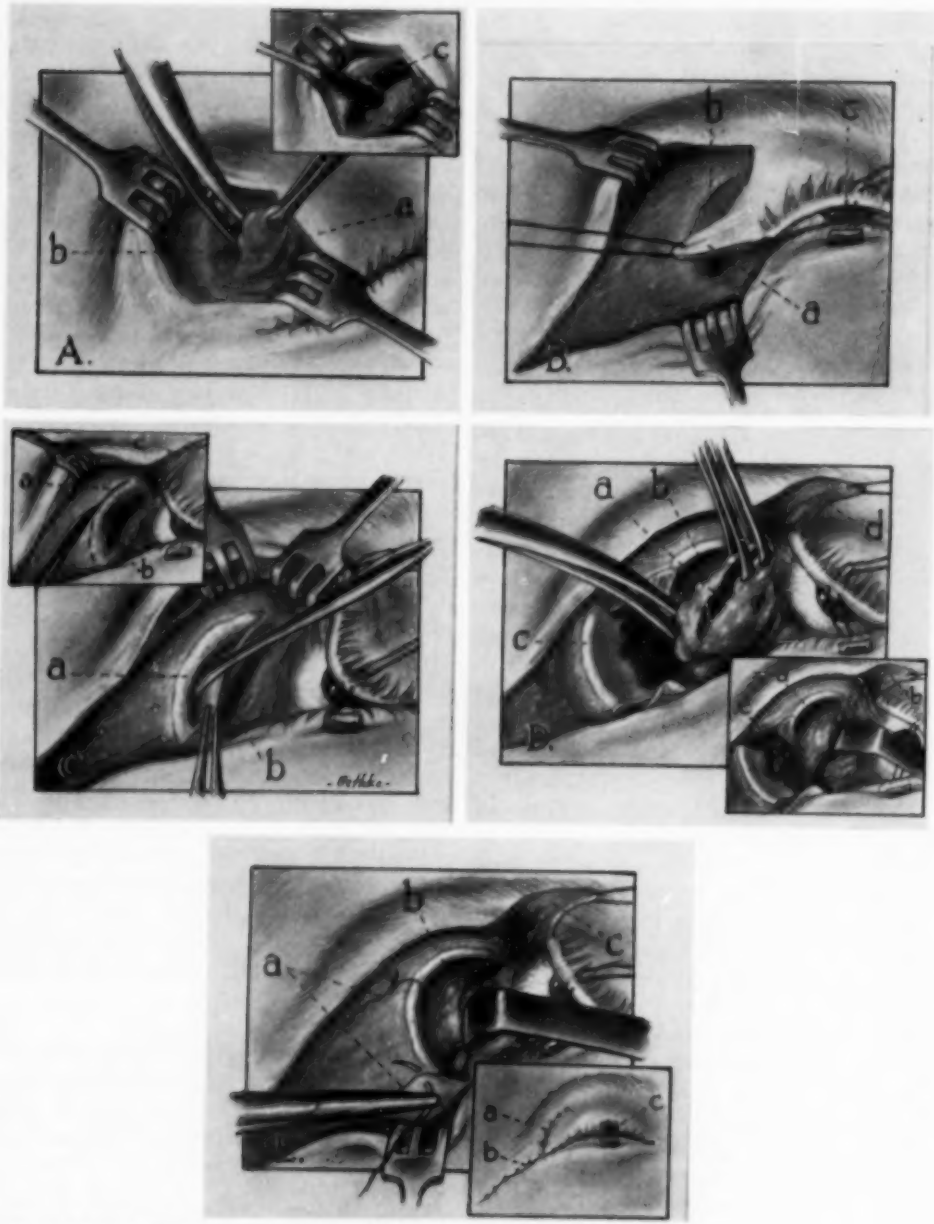

Fig. 1 (Reese). The treatment of expanding lesions of the orbit.

A: (a) Excision of material for biopsy. (b) Bony orbital margin. (Insert) A cotton swab applying methylene blue to the suture line of the fascia "c" after removal of biopsy.

B: (a) Upper lid with a traction suture through its tip. (b) Bony orbital margin. (c) Double-arm silk suture through rubber "pig" to close palpebral aperture at completion of operation.

C: (a) Bare bone after reflection of periosteum. (b) Suture line of fascia stained with methylene blue

therefore, has an ideal opportunity to invade bone if such a proclivity exists. Bone invasion seems to be the major factor to account for the difference in prognosis between these tumors in the two sites—the salivary gland and the lacrimal gland. In my experience they prove fatal because of uncontrolled or uncontrollable involvement of the cranial bones. Therefore, the periosteum must be taken routinely with the tumor and the surgical exposure must be adequate to inspect the bone directly. If there is bone invasion the bone must be resected, and should be resected routinely in cases of carcinoma.

d. The tendency of the carcinomas, and particularly the adenoid cystic type, to extend along nerves. The supraorbital nerve, which is usually included in exenteration, should be removed up to its exit from the orbit.

3. *An inadequate surgical approach.* I know of no surgical approach to the lacrimal gland fossa to date which is adequate to handle tumors in this region. The direct approach through the skin incision parallel to the orbital margin over the area of the lacrimal gland fossa is most unsatisfactory. The exposure is poor; the fossa lies back of an overhanging bony margin which frequently is accentuated in the presence of an expanding lesion in the fossa because the expanding lesion apparently causes tension of the orbital septum and thus produces an exostosis of the overhanging edge making the fossa even more inaccessible. The Krönlein operation alone is inadequate and the transcranial approach is not feasible because only a small portion of the involved area lies adjacent to the anterior cranial fossa (fig. 2B). The Benedict approach through the upper lid with reflection of the periosteum is the best I know of to date but even this does not give the required exposure.

I should like to recommend, therefore, a

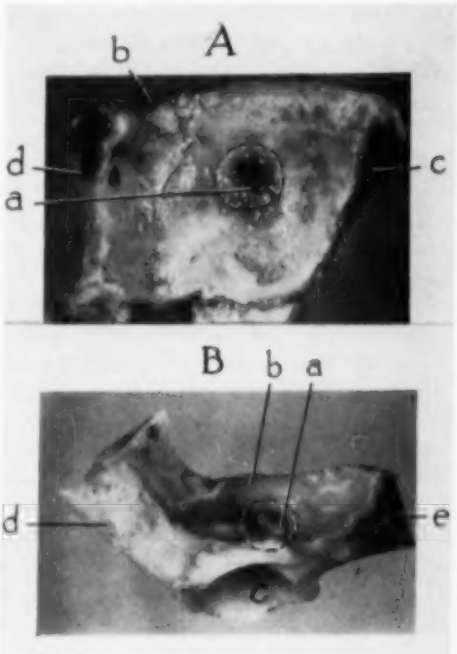

Fig. 2 (Reese). Resection of the bony lacrimal-gland fossa for bone invasion by a benign mixed tumor of the lacrimal gland. This was not apparent by X-ray examination or palpation but through direct inspection.

A: Inner surface of orbit. (a) Bone invasion. (b) Superior orbital margin. (c) Nasal margin. (d) Temporal margin.

B: Oblique view of A. (a) Bone invasion. (b) Superior orbital margin. (c) Anterior cranial fossa. (d) Nasal margin. (e) Temporal margin.

after removal of tissue for biopsy. Insert: (a) Incision in periosteum. (b) Biopsy suture line. (c) Reflected upper lid.

D: (a) Tumor mass held in Allis clamp and reflected from bone. (b) Bony lacrimal gland fossa. (c) Reflected lateral wall of orbit. (d) Upper lid retracted with traction suture. Insert: (a) Exposure of roof of bony orbit after removal of tumor. (b) Upper lid retracted by traction suture. (c) Opening in lateral wall of orbit.

E: (a) Lateral wall of orbit sutured in place. (b) Exposure of roof of orbit with orbital contents retracted nasally. (c) Upper lid retracted with traction suture. Insert: (a) Sutured skin incision for biopsy. (b) Sutured skin incision for Krönlein operation. (c) Palpebral aperture closed with double-arm suture tied over rubber "pigs."

procedure for handling these lesions which I have employed 11 times with satisfaction and which I think tends to combat the various causes for failure enumerated.

An incision is made in the skin just under the brow concentric with the orbital margin over the region of the lacrimal gland (fig. 1A). The fascial planes over the lesion are incised and reflected. The lesion is firmly grasped with an Allis clamp and a portion excised (fig. 1A-a) using precautions not to disseminate any of the tissue cells. A deep wedge of tissue must be removed for sometimes normal lacrimal gland tissue is most superficial. While this biopsy material is being prepared for frozen sections and until the pathology report is given, the fascial planes are closed with plain catgut sutures and the line of closure marked with methylene blue (fig. 1A-c). If the report on the frozen section is "mixed tumor" then a modified Krönlein operation is done as described below. If the report is "carcinoma" then the skin incision is closed and the patient informed the following day, or after adequate histologic examination and confirmation, that an exenteration of the orbit is indicated. If the pathologic diagnosis is "lymphosarcoma" then, of course, closure is done and irradiation advised. If the diagnosis is "chronic granuloma" then the biopsy incision is closed and the nature of the lesion discussed with the patient. Perhaps no further local treatment is indicated unless the microscopic examination shows a big element of lymphocytic infiltration in which case benefit might be expected from irradiation.

The modified Krönlein operation is done by extending the incision under the brow to meet the usual Krönlein incision extending horizontally from the external canthus (fig. 1B). The tissues are dissected back to expose the outer half of the bony orbital margin above and the entire lateral wall (fig. 1B). In dissecting the lid back in order to expose the upper margin of the orbit, the dissection must be kept in the plane of the levator muscle. A traction suture is placed in the skin of the upper lid (fig. 1B-a) and the lid is reflected nasally out of the field of operation. An incision is made in the periosteum along the orbital margin of the outer half above and the entire lateral half (fig. 1C-insert). With an elevator the periosteum is dissected away from the bone along with the lesion occupying the lacrimal gland fossa (fig. 1C). The lateral wall of the orbit is then resected by using the oscillating Strycker saw and according to the usual Krönlein technique (fig. 1D). The lesion in the lacrimal fossa is then excised together with its adherent periosteum.

The cosmetic result is good. The operation can be done without producing a ptosis or there may be a negligible amount causing no real blemish. I prefer not to reattach the external canthal ligament. If the ligament is reattached there may occur adhesions to the external bony wall which lengthen the palpebral aperture and encourage a ptosis of some degree.

When the exenteration is being done for carcinoma the bony orbital wall in and around the lacrimal gland fossa must be resected even though no gross involvement is seen or demonstrated by X-ray examination. When resecting the orbital wall in the region of the lacrimal gland it must be remembered that just posterior to the fossa is the anterior cranial cavity. The dura, therefore, is usually exposed.

If the bone involvement is more extensive than just the region of the lacrimal gland fossa, as may be the case particularly in recurrent disease, then it is possible that a more extensive bone resection is necessary.

Of late, there has been increasing interest in epithelial tumors of the lacrimal gland (Forrest,[4] Jones and Pfeiffer[6]) and two important contributions will appear soon—a monograph by Davies[3] and another by Ackerman and Sanders,[2] the latter reporting on material from the Armed Forces Institute of Pathology. These tumors are rare and we

must pool our resources for a better understanding of them. I believe, though, that we are belatedly pushing back the ophthalmologic frontier in this field and it is my hope that this, the seventh Bedell lecture, will contribute in some measure to this goal.

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AQUEOUS PATHWAYS IN SOME CASES OF GLAUCOMA*

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During the decade following the discovery of aqueous veins by Ascher and by Goldmann, many workers have studied the role of these structures in the genesis of glaucoma. Most comprehensive of the numerous studies are those by Ascher, by Goldmann, by Thomassen and Bakken, and by Grant.

Almost simultaneously, in 1941, Ascher and Goldmann clinically found clear and striated vessels in the limbal area. From clinical observation and various tests, they were certain that these vessels contained aqueous humor and some blood. Concerning the origin of these vessels, both Ascher and Goldmann came to the conclusion that they originated from the canal of Schlemm and either directly or in a circuitous manner reached the surface of the sclera. The vessels were named "aqueous veins."

Although, from the time of Leber, it was known that the deep scleral veins anastomosed with the anterior ciliary veins, the recent works of Theobald, Ashton, and Thomassen and Bakken added further proof that the aqueous veins have their origin in Schlemm's canal.

It is needless here to go into a detailed description of the anatomy of the drainage system of the eye, as this has been adequately done by Maggiore, Sondermann, Theobald, and Ashton. It is generally accepted that, in normal eyes, there is no obstruction to aqueous outflow between the anterior chamber, the canal of Schlemm, and its connections with the ciliary veins. (To appreciate pathologic changes, one must first understand the normal structure. Several normal limbal areas are shown in Figure 1.)

The aqueous pathways are slits in the sclera lined with a single layer of endothelium and, as Thomassen and Bakken have reiterated, it is of particular interest that they have no muscles in their walls.

It is only a natural sequence of the discovery of aqueous veins by Ascher and Goldmann that the spotlight of investigation

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* From the Department of Ophthalmology, University of Illinois School of Medicine, and the Illinois Eye and Ear Infirmary, Chicago. Presented at the 91st annual meeting of the American Ophthalmological Society, White Sulphur Springs, West Virginia, June, 1955. This paper will appear in the *Transactions of the American Ophthalmological Society*. It is published here with the permission of the American Ophthalmological Society and the Columbia University Press.

† By invitation.

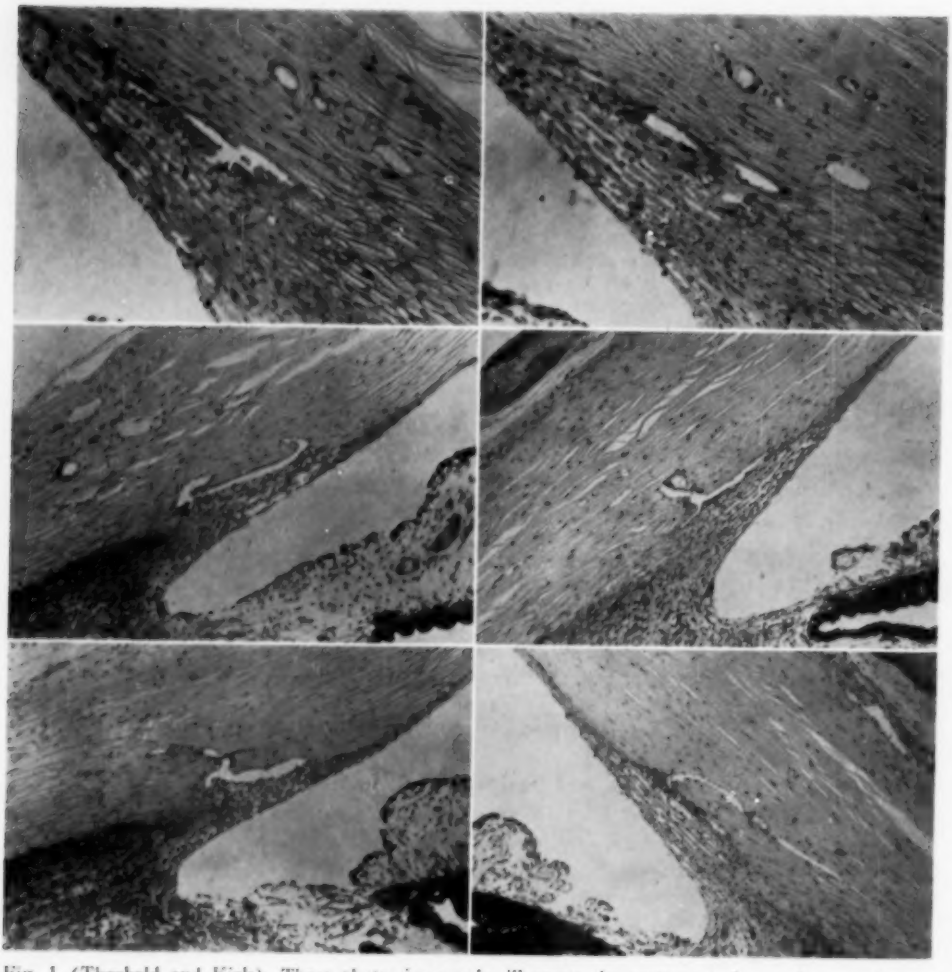

Fig. 1 (Theobald and Kirk). These photomicrographs illustrate the aqueous pathways in normal eyes.

should be focused on their role in glaucoma.

Ascher and Goldmann concluded from various clinical observations that the outlets of Schlemm's canal are narrowed in some cases of glaucoma. Ascher bases his hypothesis on the following clinical tests and observations in glaucomatous eyes:

1. The clear fluid stream in the aqueous veins is visibly narrower, shorter, and slower moving.

2. In the glass-rod test, the aqueous-influx phenomenon rarely occurs after compression of the recipient vessel.

3. After the compression test, stratification of blood and aqueous reappears slowly.

4. Blood streaming toward the limbus during the compression of the recipient vessel rarely becomes visible inside the canal.

5. Greater pressure must be applied to the globe in order to increase the visible flow of clear fluid in the aqueous veins.

6. Relatively low dynamometric pressure may force blood into the aqueous veins during the compensation-maximum test.

7. The resistance to outflow calculated from continuous tonometric pressure is

higher in chronic simple glaucomatous eyes than in eyes with normal pressure.

In experimental studies Goldmann found that the "apparent outflow pressure" is always increased during high tension in chronic simple glaucoma. It is increased in glaucoma even if the tension of the eye has been made normal by drugs. On the other hand, in cases of acute glaucoma normalized by drugs, this outflow pressure is normal. In cases of chronic congestive glaucoma normalized by drugs, it is sometimes found to be elevated, sometimes normal. Therefore, it seems possible to discover very early states of simple glaucoma by the measurement of the "apparent outflow pressure."

Goldmann also says that normally the resistance to flow attributable to the filtration process is quite small, and that possibly a large portion of the resistance first occurs in the passage from Schlemm's canal into the tiny drainage vessels.

Thomassen and Bakken injected one-percent solution of methylene blue into the anterior chamber of the human eye in situ, and found that the dye stained the epibulbar vessels if the intraocular pressure was kept above the original pressure, and the number of stained vessels increased in proportion to the height of the pressure. If the injection was performed after enucleation, a very strong staining of the epibulbar vessels was observed, even at low pressure.

These experiments showed that the normal eye possesses a very great capacity for compensating a superpressure. Consequently, it is difficult to believe that any kind of glaucoma is caused by an increased production of aqueous humor only. It would seem more probable that a hampered escape would be the principal factor.

Grant, employing an electronic tonometer and recording galvanometer, has given proof that obstruction to outflow of aqueous is the only factor in the increased tension in glaucoma. He says that "in glaucomatous eyes, elevation of tension above normal has been found in every instance to be due exclusively to abnormal resistance to aqueous outflow, and no case of glaucoma due to hyperformation of aqueous has been observed."

Histologically, Maggiore found that the canal of Schlemm constitutes the most definite pathway for the elimination of intraocular fluid. Schlemm's canal is a structure in itself if annexed to the circumcorneal blood circulation. All the alterations of Schlemm's canal are consecutive to the alterations of the corneoscleral trabeculae or to the adherence of the root of the iris to the trabeculae. In about 10 percent of glaucoma cases, only the trabeculae appear altered (wide-angle glaucoma); in the rest, the alterations are related to the fusion of the iris to its deep surface. However, the alterations that the microscopic examination shows consist of:

1. Infiltration of coagulable albuminous liquid and/or cellular elements in the intertrabecular spaces.

2. Thickening of the trabecular fibers, swelling by imbibition; the trabecula assumes in sections a lamellar aspect.

3. Condensation of the trabecular fibers, neoformation of connective-tissue fibers; the trabecula assumes a compact connective-tissue structure.

Due to these histologic changes in the trabeculae, modifications in the width of the lumen in Schlemm's canal occur:

1. The lumen may be dilated. In these cases it most often contains blood.

2. The lumen may be restricted in all degrees to the point of being virtually absent or obliterated.

3. The lumen can disappear through complete collapse of the walls so that it is seen only as a series of nuclei which are the remnants of the original endothelial lining.

4. Every trace of the canal of Schlemm can disappear when the endothelial walls fuse with the other interlamellar elements.

From the physiopathologic point of view, the function of Schlemm's canal can decrease or cease entirely, even without the canal itself being altered. For a classic example one may point to the increase in tension which

occurs in those cases in which the root of the iris is thrust against the trabecula.

Maggiore considers as reciprocal the function of Schlemm's canal and the trabecula; reciprocal in the sense that one lacking function renders vain the functions of the other.

5. And, as a fifth point, Maggiore mentions the dissociation of the trabeculae with notable widening of the intermediate spaces.

Focosi examined histologically an eye which had suffered and recovered from a short attack of glaucoma. Five days after this abortive attack, the patient died. Examination of the eye disclosed:

"A partial closure of the chamber angle and partial obliteration of Schlemm's canal. Evidences of congestion due to amorphous masses (albuminoid) were seen in the ciliary extensions of the iris; also seen were some calcifications in the choroid, in Schlemm's canal, and in one collector channel of the canal." (Goldmann, 1952.)

Present study

For many years one of us (G. D. T.) has observed the narrowing and even obliteration of the intrascleral veins in glaucomatous eyes sent to the pathology laboratory. The pathologic anatomy of the obstruction to outflow through the intrascleral veins between the canal of Schlemm and the episcleral vessels has received only passing mention in ophthalmologic literature.

The presence of these narrowed and obliterated scleral vessels in glaucomatous eyes was the inspiration for seeking a mechanism which could be responsible for bringing about these changes.

The following pathologic changes were observed in the eyes studied:

1. Obliteration of the lumen of Schlemm's canal (figs. 2a, 3a, 3b, 4a, 5b, 6a, and 6b).

2. Early narrowing of the intrascleral veins (fig. 5b).

3. Narrowing of the external collector channels (fig. 4b).

4. Complete collapse of the external collector channels and intrascleral veins (figs. 3b, 5b, and 6b).

5. Narrowing of the episcleral vessels (figs. 2b and 4b).

6. Sclerosis and thickening of the trabecular fibers.

The obstructions in the trabecula-canal of Schlemm area as described by Maggiore, Verhoeff, and others are now generally accepted as causing many cases of glaucoma. Varying amounts of sclerosis of the trabecular fibers, narrowing, and even complete obliteration of the intratrabecular spaces have been described. In some late cases, the entire trabecula has become a homogeneous, hyalinized structure.

During the present study many glaucomatous eyes were examined for the purpose of finding the possible role of the intrascleral veins in the etiology of some cases of glaucoma. The difficulty of obtaining early glaucomatous eyes has been the main problem. By the time glaucomatous eyes are enucleated, most have undergone secondary changes. In examining these eyes it was therefore necessary to attempt to reconstruct the progressive series of pathologic changes which were responsible for enucleation. In some cases, it was impossible to say which pathologic process was reponsible for the glaucoma and which changes resulted from the elevated tension.

Several glaucomatous eyes were studied in which there was minimal obstruction to the trabecula-canal of Schlemm area. In some of these cases, a decided narrowing, and even obliteration, of some of the intrascleral vessels was noted. From a study of these specimens, it would be impossible to say dogmatically whether the obstruction occurred first in the intrascleral vessels or in the trabecula-canal of Schlemm area. However, Ascher's convincing clinical observations, together with our histologic observations, led us to the belief that, in many of these cases, the first obstruction to the outflow of aqueous might well have occurred in the intrascleral veins.

The diameter of the intrascleral veins in normal and glaucomatous eyes was measured with a micrometer. Since there is a great

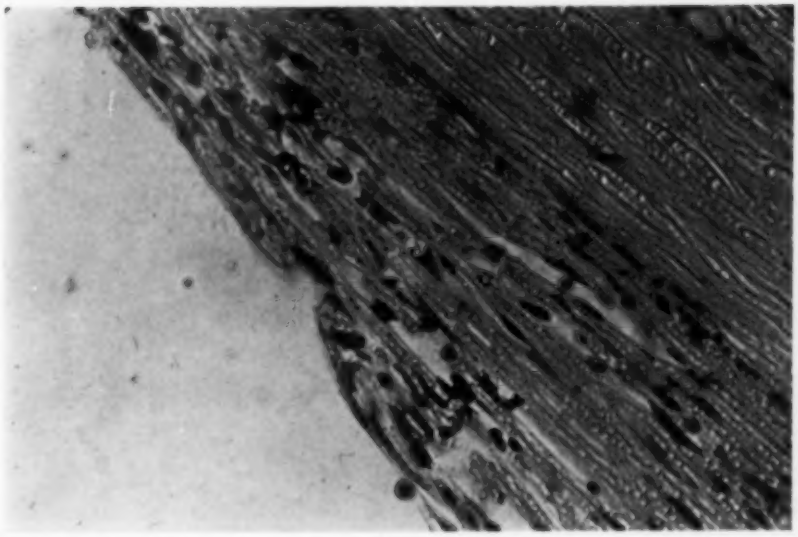

Fig. 2a (Theobald and Kirk). *Case 1.* A woman (7123), aged 59 years, had gradual loss of vision with pain for one year. Clinical diagnosis of wide-angle chronic simple glaucoma was made. During the year, the tension fluctuated between 40 and 70 mm. Hg (Schiøtz). The eye gradually became blind and severely painful.

This photomicrograph shows obliteration of the lumen of Schlemm's canal due to hypertrophy and sclerosis of the trabeculae and the overlying sclera. The scleral fibers are hyalinized as well as hypertrophied. Some pigment cells are seen between the trabeculae.

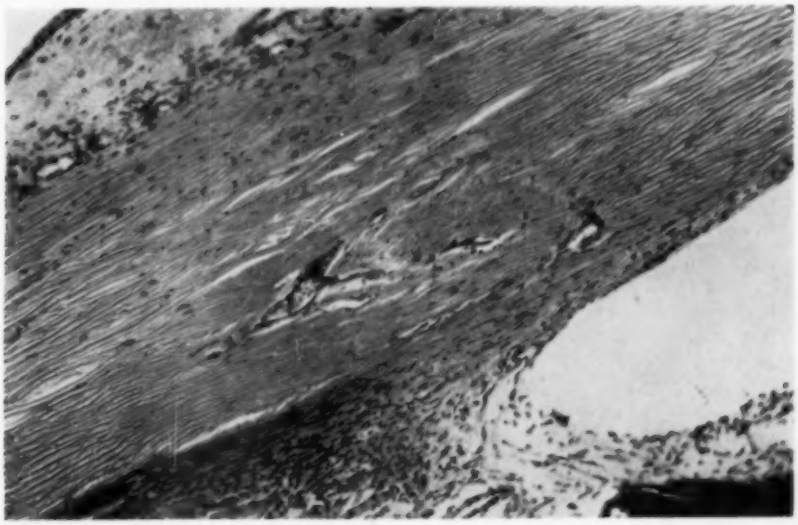

Fig. 2b (Theobald and Kirk). *Case 1.* This shows marked sclerosis and compression of the trabeculae, a compressed canal of Schlemm, and marked narrowing of the intrascleral veins. Some veins are indicated by a double row of nuclei; some contain a few pigment cells. The veins in the episclera are also compressed.

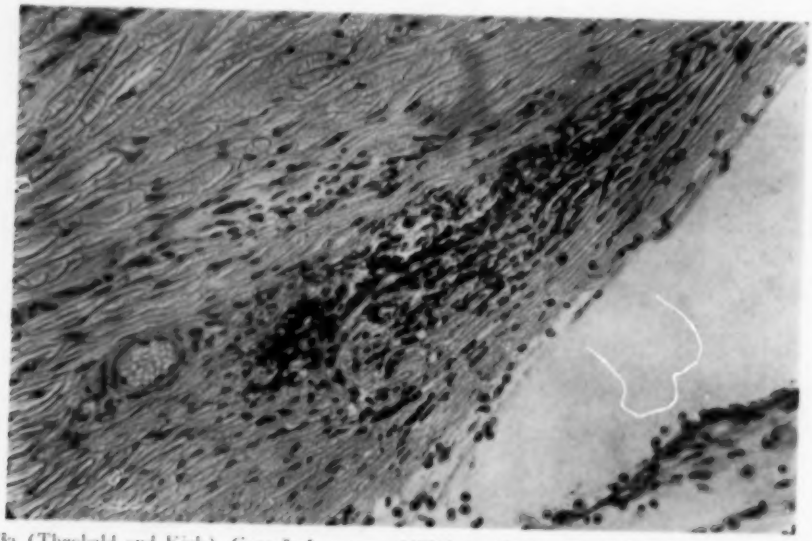

Fig. 3a (Theobald and Kirk). *Case 2.* A woman (6866), aged 66 years, had gradual loss of vision for one year when she came to the clinic suffering with pain. Her tension was absolute. Clinical diagnosis was chronic wide-angle glaucoma. Surgery did not relieve pain or tension, and six months later the eye was enucleated.

The sections show obliteration of the intratrabecular spaces and Schlemm's canal by hypertrophy of the trabeculae. In addition to the hypertrophy and sclerosis of the trabeculae, the spaces are blocked by pigment and wandering cells. The intrascleral veins are compressed to a line composed of nuclei. The walls of the artery are thickened. Note the thickening and sclerosis of the scleral fibers.

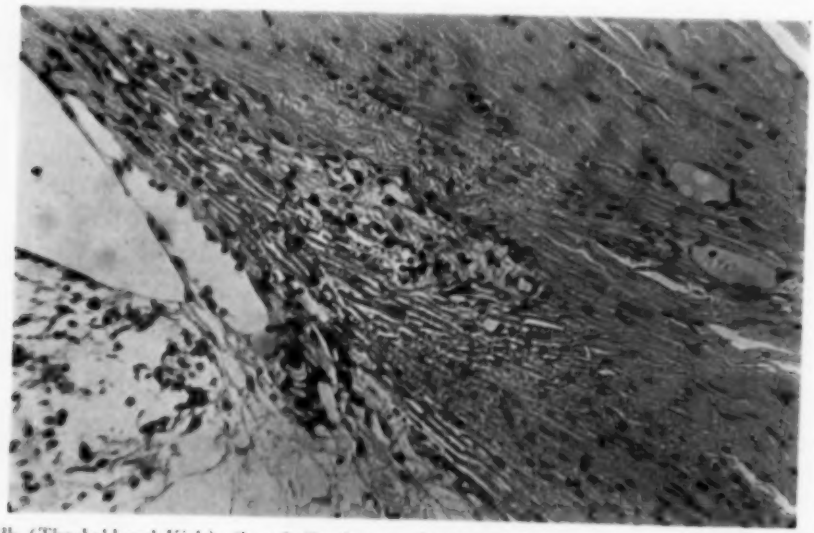

Fig. 3b (Theobald and Kirk). *Case 2.* On the opposite side of the same section as shown in Figure 3a, the region of the canal has a foamlike appearance due to edema. The deep veins are compressed; the more anterior ones are wide open.

Fig. 4a (Theobald and Kirk). *Case 3.* A man (6267), aged 77 years, until seven weeks ago believed that his right eye was normal. Accidentally he got sawdust into his eye; since then it has been red, tender, and painful. There was lacrimation, corneal edema, and no light perception. Clinical diagnosis was absolute wide-angle glaucoma. Judging by the marked narrowing of the aqueous outlets, the glaucoma has been present for a long period of time.

This photomicrograph shows, in addition to the sclerosis of the sclera and trabeculae, pigment in the canal and narrowed external collector channels.

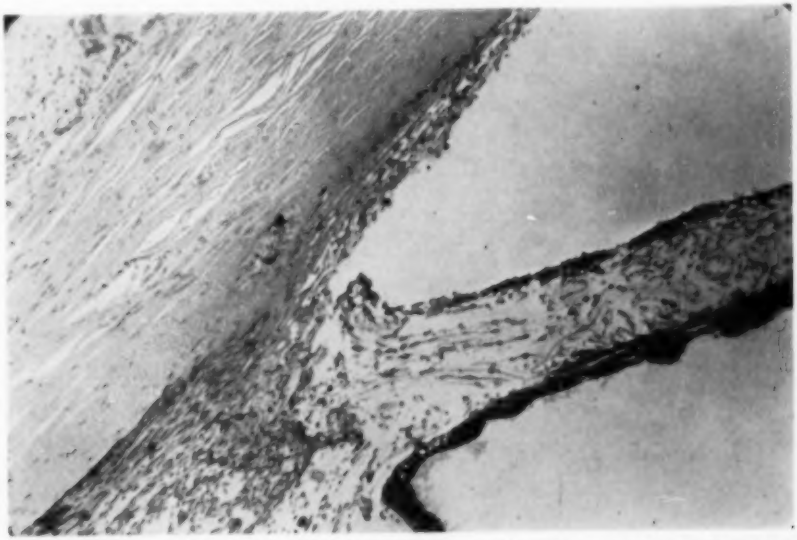

Fig. 4b (Theobald and Kirk). *Case 3.* In this section, the canal is obliterated by the fibrosed trabeculae and the narrowed vein anterior to it contains pigment. There are several veins in the sclera reduced to rows of a few nuclei. The episcleral veins are narrowed.

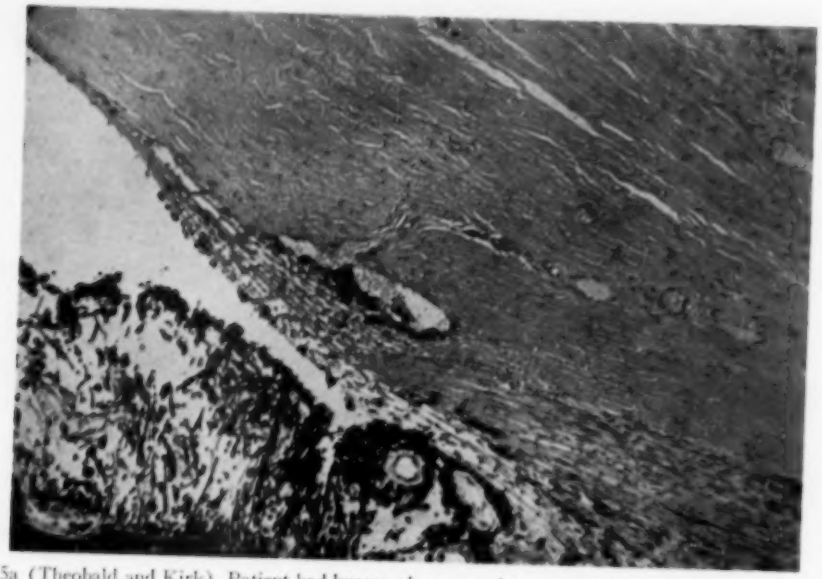

Fig. 5a (Theobald and Kirk). Patient had known glaucoma of two months' duration. This section shows the narrowing of an external collector channel in an early case of glaucoma. Other veins are somewhat narrowed. Sclerosis of the sclera and outermost trabecular fibers is evident. Pigment granules lie on the inner surface of the trabeculae.

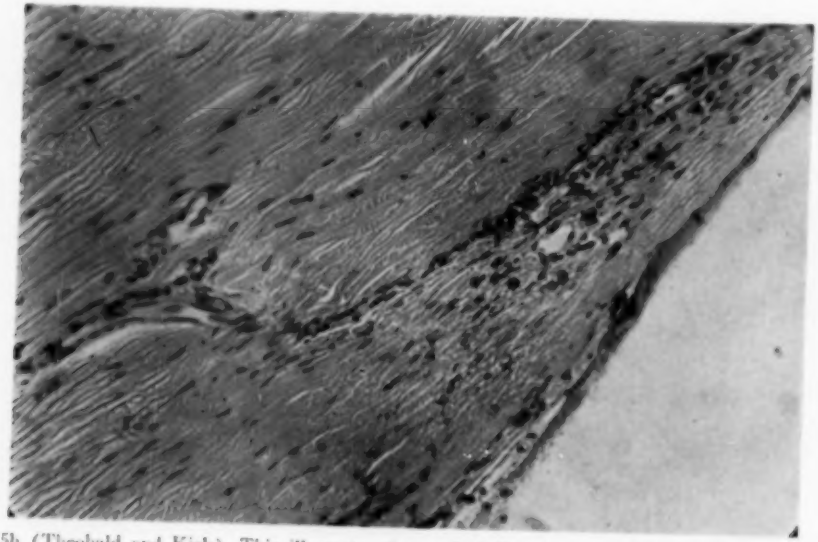

Fig. 5b (Theobald and Kirk). This illustrates the marked fibrosis of the trabecular fibers in a long-standing glaucoma. The pigment granules must have been present before the formation of the hyaline membrane that lies in the angle. The canal and the external collector channel are outlined by rows of nuclei. The scleral fibers are hypertrophied and sclerosed.

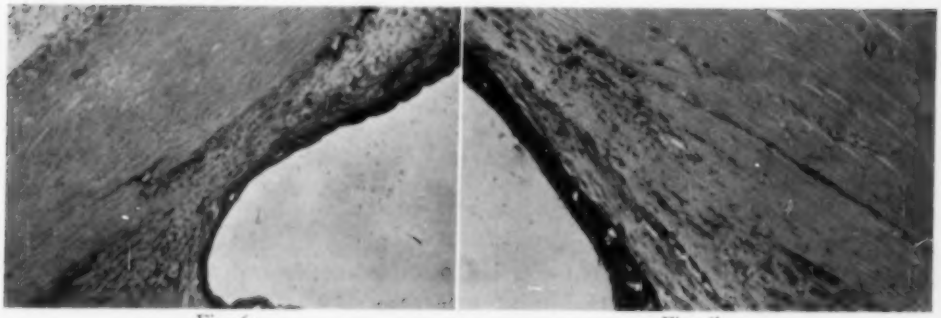

Fig. 6a Fig. 6b

Figs. 6a and 6b (Theobald and Kirk). These sections are from the eye of a man, aged 75 years, who had known glaucoma for four years. They are presented to show the extreme narrowing of the vessels in an old case of absolute glaucoma. Note the hypertrophied, sclerosed scleral fibers, as well as the pigment outlining the external collector channels, which must have been present before the angle became obliterated by anterior synechias.

variation in the number and size of veins in different parts of the same eye, it was necessary to measure the vessels in a large number of sections from each eye to obtain an accurate average diameter.

In normal eyes the diameter of the external collector channels as they leave the canal of Schlemm varies from 30 to 165 microns. The perpendicular diameter of the veins as they pass through the sclera varies from five to 50 microns.

The average width of the intrascleral veins in glaucomatous eyes was found to be much smaller than in normal specimens. The actual measurements in old glaucomatous eyes probably do not give an accurate comparison. This method of evaluation is to be continued as more early, uncomplicated glaucomatous eyes become available. Also detailed studies of the character of the individual scleral fibers in normal and glaucomatous eyes are contemplated.

The intrascleral veins are slits in the sclera lined with a single layer of endothelium. Any narrowing must result from changes in surrounding tissues. It must be remembered that these veins have no muscular walls and variations in their caliber, therefore, are not accomplished by the veins themselves.

A review of the specimens presented in this study shows that there was no new formation of connective tissue around or in the walls of the veins which might account for their closure. Also there was no endothelial proliferation which might result in obstruction of the lumen. The endothelial lining of the veins seemed to be crowded together so that gradual closure of the lumen resulted. It was this lack of a localized disease in and around the veins which caused us to search within the sclera itself for the process responsible for venous closure.

The sclera is primarily composed of collagenous connective tissue and it soon became apparent that a knowledge of collagenous tissue was imperative in interpreting the possible etiology of the closure of the veins.

From the Josiah Macy, Jr., Foundation conferences and Jackson (in Randall) we gather the following information on connective tissue:

"Collagen fibers are a characteristic feature of connective tissue . . . and all connective tissues are composed of:

1. Cells: fibroblasts or fibrocytes, histiocytes, mast cells, and leukocytes.
2. Fibers: collagen, reticular, and elastic.
3. Extracellular material: matrix, composed of protein, polysaccharides of the hyaluronic-acid type, and their sulfuric esters."

According to Bennett, an aged individual seems to have a denser and more solid collagenous framework than does a younger one. Dempsey (quoted by Bennett, G. A.) was not sure that removal of ground substance between the fibers was the cause of this increased density and felt that the fibers themselves were enlarged by coalescence of smaller fibers. Bennett's findings seemed to be verified by Gross who studied the collagen fibers of rats of different ages by means of the electron microscope. He showed that, early in life, the fibers were all small, and that they seemed to coalesce, or at least increase in diameter as the age of the rat increased.

Randall stated that collagen fibers may undergo hyalinization at which time they cannot be resolved into individual fibers. This change occurs either with advanced age, or is due to nonspecific inflammatory processes.

What bearing can these studies in collagen tissues have on sclera which is, according to Krause, a forgotten tissue?

The sclera is composed of connective tissue elements, collagen, reticular and elastic fibers. According to the observations on connective tissue, the collagenous structures tend to hypertrophy and sclerose with age.

Friedenwald, in his chapter on *Problems of Aging*, has said that the sclera of the aged is thinner and denser than that of the young and shows a loss of water.

Berens believes that the sclera thickens with age, becoming more rigid and yellowish.

Rones says that "the connective tissue bundles show some widening and sclerosis, with a diminution in the number of nuclei. A definite degeneration of the elastic tissue occurs."

Verhoeff (1915) recognized primary sclerosis and thickening of the pectinate ligament due to age.

Sondermann observed that increased sclerosis of the sclera could cause narrowing of the aqueous veins.

Schieck found that even when the vein itself is structurally unimpaired, it could be mechanically compressed almost to obliteration in the oblique scleral canal.

Discussion

Chronic simple glaucoma is a disease primarily occurring in middle and old age. It has been observed that collagen tends to hypertrophy and sclerose with age. The sclera is composed of the three components of connective tissue—collagen, reticular and elastic fibers.

It seems logical therefore to assume that hypertrophy and sclerosis of the collagenous scleral fibers associated with aging can produce narrowing or occlusion of the intrascleral veins, resulting in glaucoma.

Ascher, Goldmann, and Grant are convinced from their clinical studies that the obstruction to outflow of aqueous from the eye in some cases of primary simple glaucoma is located in the deep scleral area. These observers found that, in glaucoma, blood does not flow back into the canal of Schlemm when pressure is applied to the surface of the eyeball. Their findings were confirmed by Kronfeld who, when using contact lenses on the eyeball, demonstrated that blood did not enter Schlemm's canal in patients with glaucoma. In addition, Goldmann and others have reported that the "apparent outflow pressure" is always increased during high tension in chronic simple glaucoma, and is increased even if the tension of the eye has been made normal by drugs.

From these findings, no other conclusion seems tenable but that some cases of chronic simple glaucoma are in all likelihood secondary to scleral hypertrophy and sclerosis.

Summary

A microscopic study of the aqueous veins in glaucomatous eyes reveals that it is probable that some cases of chronic simple glaucoma are secondary to hypertrophy and sclerosis of the sclera resulting in closure of the veins and obstruction to aqueous outflow.

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A STUDY OF RETINOBLASTOMA

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Eyes from 176 cases of retinoblastoma submitted to the eye pathology laboratory of the Massachusetts Eye and Ear Infirmary served as a basis for the statistical study here presented. The laboratory specimens were submitted by the infirmary staff and other ophthalmologists; therefore, clinical information of variable completeness was available for each case. Additional information was obtained when possible from hospital records, outside ophthalmologists, and personal communications with patients and relatives of patients. Furthermore, each adequately preserved specimen was re-examined microscopically and all the data on pathology were assembled from this re-examination to insure uniformity of interpretation.

CLINICAL DATA

The 176 cases of this series are the total number of cases of retinoblastoma represented by specimens in the laboratory from 1897 to 1951. By decades they varied between 0.8 and 1.6 percent of the total number of specimens of all types submitted to the laboratory.

Information as to the sex of the patient was obtained from 152 cases. From the group of cases with unilateral involvement, 51 were females and 75 males. From the group with bilateral involvement 11 were females and 15 males. In 68 cases the right eye was first involved; in 63, the left. In 15 patients, both eyes were involved when first seen. In 27 patients both eyes were eventually involved (18.5 percent of the 146 for whom these data were available).

When examples of involvement occurring after the age of six years are excluded for statistical purposes, the mean age at onset of symptoms‡ is 21.7 months and the mean age at initial treatment is 26.6 months (fig. 1). The 176 patients have been subdivided into two groups—those enucleated between 1898 and 1929 and between 1930 and 1951. For each group the duration of symptoms before treatment has been calculated as noted in Table 1. Before 1930, 69 percent had symptoms longer than three months and 49 percent had symptoms longer than six months before treatment. In the patient whose symptoms were noted 60 months before treatment, the initial symptom was an esotropia beginning when one year old. When the child was a few months over six years old, retinoblastoma was diagnosed in the esotropic eye. The tumor may or may not have been present during this interval.

The youngest patient presented symptoms noted at two weeks of age, enucleation was at four weeks. Two patients through parents gave histories of symptoms at birth. The oldest patient in our series was 47 and one-half years of age at the onset of symptoms, and enucleation took place six months later (previously reported[10]).

With bilateral involvement, when data were available, the length of time between enucleation of the first and the onset of treatment of the second eye was between four and 39 months.

Adequate follow-up was obtained for a random series of 79 patients. After excluding

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‡ The term, "symptoms," as used throughout the paper refers to the complaints on the part of relatives or patients about which medical opinion was requested. "Symptoms" mainly relate to changes in ocular appearance noted by parents of the child or others.

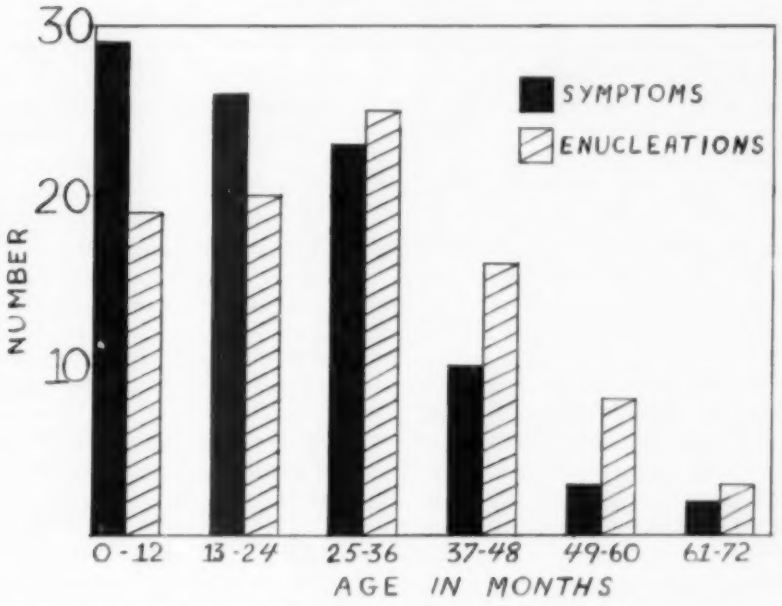

Fig. 1 (Herm and Heath). Age at onset of symptoms versus age at enucleation.

two operative deaths, over-all mortality from the disease was 18 positive tumor deaths and one possible tumor death,* a 23.7 percent known mortality. Of the 77 patients, both eyes ultimately became involved in 19 or 24.6 percent. One patient probably had involvement of the second eye but the records were inadequate. Of the 19 with definite bilateral involvement, four or 21 percent died of the tumor. Of the 56 with unilateral involvement (excluding again the possible tumor death) 13 or 23.2 percent died of the tumor.

Forty-one of the 58 survivors were followed five years or more, 10 were followed 36 to 59 months, and seven were followed 31 to 35 months. The longest follow-up is 39 years, the shortest 31 months. The oldest patient in this series (48 years of age at the time of enucleation) survived until the age of 60 years when he died of "cerebral thrombosis."

* In the possible tumor death, the patient died six months after enucleation without benefit of postmortem examination of "acute nephritis" as diagnosed by symptoms.

Following are the periods of survival after enucleation of the first eye (primary treatment in all cases) of those who died, exclusive of the possible tumor death:

Months survival	No. of cases
0-3	1
4-6	4
7-12	7
13-18	2
19-24	1
25-30	1
31-36	1
37-48	1†

Table 2 is a comparison of the three-year survival of bilateral against unilateral disease, as well as a comparison of the end re-

† This patient survived 48 months before ultimately dying of tumor. At birth an abnormal pupillary reflex was noted in the right eye. The right eye was enucleated February 5, 1914, at the age of 10 weeks. On May 1, 1917, the left eye was enucleated. The patient died February 12, 1918, with the death certificate reading "carcinoma of eye and brain." At the time of enucleation of the left eye a nodule was felt on the under surface of the left upper lid. Microscopic extrascleral extension of the tumor was noted in the left eye. No postmortem examination was done, but the cause of death can scarcely be doubted.

TABLE 1

DURATION OF SYMPTOMS BEFORE INITIAL TREATMENT BEFORE AND AFTER 1930

Months	1897–1929	1930–1951
1 or less	5	20
2–3	7	14
4–6	8	9
7–12	14	6
18	1	0
19	1	1
21	1	0
29	1	1
30	1	0
60	0	1 (See text)

sults before and after 1930 in each group. Three years has been chosen as the critical period of survival. As noted previously, most of the three-year survivors also fall into the five-year survivors.

The age at onset of symptoms in those who died is as follows:

Months	No. of cases
Less than 1	2
1-3	0
4-6	2
7-12	3
13-24	5
25-36	2
37-48	1

The mean age of onset of symptoms is 15.7 months.

Of the survivors 28 percent had symptoms longer than three months and 15 percent longer than six months before initial treatment. Of the fatalities 56 percent had symptoms longer than three months and 44 percent longer than six months before initial

TABLE 3

DURATION OF SYMPTOMS BEFORE INITIAL TREATMENT IN FATALITIES AND SURVIVORS

Months	Fatalities	Survivors
1 or less	1	17
2–3	6	17
4–6	2	6
7–12	3	6
19	2	0
27	1	0
30	0	1
60	1	0

treatment (table 3). Of the 58 survivors, eight have 16 children* ranging in age from seven months to 13 years. Three of these children had bilateral retinoblastoma. Detailed description of this group follows:

Case 1. H. W., male. Had enucleation for unilateral retinoblastoma at the age of three years. He has three healthy children, aged 10 years, six years, and two years.

Case 2. R. C., male. Had enucleation for unilateral retinoblastoma at the age of 11 weeks. He has one healthy child, aged 13 years.

Case 3. M. M., female. Had enucleation for unilateral retinoblastoma at the age of three years. She has one child, aged four years, who had bilateral enucleation for ret-

* Since preparation of this paper, the following article by A. B. Reese has appeared: "Frequency of retinoblastoma in the progeny of parents who have survived the disease," A.M.A. Arch. Ophth., **52**:815-818, 1954. He reported an additional 10 families with 21 children of whom 15 were affected by the tumor.

TABLE 2

SURVIVAL STATISTICS

Years	Total No. Cases	% Known Tumor Deaths	No. Cases Followed 3 Years or More	% Surviving 3 Years
	Unilateral Tumor			
1900–1929	15	33.3	15	66.7
1930–1951	41	19.8	39	79.5
	Bilateral Tumor			
1900–1929	2	50	2	50
1930–1951	17	17.6	14	78.5

inoblastoma; O.D., age four weeks, and O.S., age one year.

Case 4. E. O., male. Had enucleation for unilateral retinoblastoma at the age of two and one-half years. He has one healthy child, aged seven months.

Case 5. P. G., female. Had enucleation for unilateral retinoblastoma at the age of 13 months. She has two healthy children, aged three years and one and one-half years.

Case 6. J. T., male. Had enucleation for unilateral retinoblastoma at the age of three years. He has four healthy children, ages eight years, six years, three years, and 11 months.

Case 7. J. B., female. Had enucleation for unilateral retinoblastoma at the age of four years. She has one healthy child, aged two years.

Case 8. R. E., female. Had enucleation for unilateral retinoblastoma at the age of six months. Her father had bilateral retinoblastoma. She has three children, aged three and one-half, five, and two years. The three and one-half year-old girl is healthy. The five-year-old girl had bilateral enucleation for retinoblastoma, O.S., at age seven months; O.D., at three years (following unsuccessful radiation begun at the age of 15 months). The two-year-old boy had bilateral retinoblastoma discovered at the age of two months.

In only one patient of the 79 was a sibling of a patient with normal parents afflicted with retinoblastoma. In this case there were four children in the family, including one set of fraternal twins. One single birth (male) and one of the twins (female) had bilateral retinoblastoma, the other children being without tumor. The twin died of tumor and the other child survived bilateral enucleation. He is institutionalized as a severe mental defective.

Pathology data

In accordance with the decision of the Committee of the American Ophthalmological Society to Investigate and Revise the Classification of Certain Retinal Conditions,[9] the term retinoblastoma has been applied to all tumors of this type. In this series the tumors have been placed in one of two groups, those with few or no rosettes (complete, incomplete, or pseudo-) and those with many rosettes (complete, incomplete, or pseudo-). This grouping of the tumors was applied to those specimens received by the laboratory before and after 1930. For the period 1898 to 1929 there were available for complete examination 76 specimens. Twenty-eight of these showed many and 48 showed no or few rosettes in most sections. For the period 1930 to 1951 complete examination was possible of 101 specimens. Of these, 55 showed many and 46 no or only few rosettes. Thus 83 specimens showed many rosettes and 94 showed few or none. In cases with bilateral involvement four had many rosettes bilaterally, five had none or few bilaterally. Four had many rosettes in one eye and few or none in the other.

The degree of optic-nerve involvement was broken down into two groups—with extension of the tumor beyond the lamina cribrosa or to the lamina (table 4).

Of those eyes with involvement of the optic nerve to the lamina cribrosa or beyond, 31 had tumors with many rosettes and 38 had tumors with few or none.

Tumor was present within the choroid of 61 eyes (34.5 percent). Eighteen of these eyes had tumors with many rosettes and 43 with few or none. In 19 eyes (10.7 percent) extrascleral extension was present. Three of these had tumors with many rosettes, and 16 few or none.

TABLE 4

Degree of optic-nerve involvement

Years	Total Eyes	Beyond Lamina	To Lamina
1900–1909	10	6	0
1910–1919	13	4 (2 more probably)	3
1920–1929	28	9	7
1930–1939	34	9	6
1940–1949	45	10	10
1950–1951	15	1	2

1900–1929, 41% had extension beyond lamina cribrosa.

1930–1951, 21% had extension beyond lamina cribrosa.

TABLE 5

DURATION OF SYMPTOMS BEFORE INITIAL TREATMENT IN THOSE WITH TUMORS WITH MANY ROSETTES VS. FEW OR NONE

Months	Tumors with Many Rosettes	Tumors with Few or No Rosettes
1 or less	17	8
2–3	13	9
4–6	8	8
7–12	7	13
18	0	1
19	0	2
21	0	1
29	0	1
30	0	1
60	0	1

CLINICOPATHOLOGY DATA

Among those cases with many rosettes, 33 percent had symptoms longer than three months before treatment and 15.5 percent longer than six months. Among those with few or no rosettes, 62 percent had symptoms longer than three months and 44 percent longer than six months before initial treatment (table 5). For these two groups of tumors, Table 6 lists the age of onset of symptoms.

There were 28 cases with tumor within the choroid for which a history was obtainable. Nineteen, or 68 percent of these, had symptoms longer than three months before treatment, and 13, or 47 percent, longer than six months. The same information was available in seven cases with extrascleral extension. These are tabulated below:

SYMPTOMS PRESENT	NO. OF CASES
1 mo.	1
3 mo.	2
6 mo.	2
12 mo.	2

The followed-up series contained 40 cases of tumors with many rosettes and 33 with few or none. The example of "possible" tumor death showed no rosettes. One fatality and two survivors had bilateral disease with many rosettes in one eye and few or none in the other. Three, 7.5 percent, of those having tumors with many rosettes, and 14, 42.4 percent, of those having few or none have died of the disease. Of those who died of tumor seven had malignant cells in the cut end of the optic nerve, five had extrascleral extension, and three had massive involvement of the choroid. It is assumed that massive choroidal involvement is an explanation of fatality. From the fatality group, 13 of the 18 showed some choroidal involvement, while among the survivors only 11 of 62 showed this involvement. Three tumor fatalities offered no adequate explanation of the cause of death from examination of the specimens because of poor preservation. The example of "possible" tumor death probably had extrascleral extension, but this specimen was poorly preserved.

Three of the fatalities are known to have had generalized metastases. The ocular pathology in these cases was as follows:

Case 1. No rosettes. Massive involvement of all ocular tissues, extension of the tumor beyond the lamina but not to the proximal cut end of the nerve. No extrascleral extension seen.

Case 2. No rosettes. Extension of the tumor to the cut end of the nerve with orbital

TABLE 6

AGE OF ONSET OF SYMPTOMS IN TUMORS WITH MANY ROSETTES VS. THOSE WITH FEW OR NONE

Age	With Many Rosettes	With Few or No Rosettes
Less than 1 mo.	4	2
1– 3 mo.	8	0
4– 6 mo.	3	3
Total 0–6 mo.	15	5
7–12 mo.	8	5
13–24 mo.	11	14
25–36 mo.	6	14
Total 7–36 mo.	25	33
37–48 mo.	2	4
4 yr.	1	2
5 yr.		1
7 yr.		1
8 yr.	1	
47½ yr.	1	
Total greater than 36 months	5	8

involvement, and massive involvement of the choroid and ciliary body.

Case 3. No rosettes. Choroid, anterior chamber, and suprachoroidea massively infiltrated with tumor. No involvement of optic nerve, and no extrascleral extension seen.

No patient with extrascleral extension is known to have survived despite later exenteration or radiation of the orbit. One patient with tumor in the cut end of the nerve is surviving 31 months after enucleation without special treatment of the orbit. No other patient with involvement of the cut end of the optic nerve is known to be living despite exenteration, radiation of the orbit, or craniotomy and removal of the intracranial portion of the nerve.

The survivor who had the single child with bilateral retinoblastoma showed no rosettes in her tumor. Both of the child's tumors showed many rosettes. The survivor whose two of three children were afflicted with bilateral retinoblastoma showed many rosettes in the tumor. Specimens of tumor from her children were not obtained.

In the case of "horizontal" transmission, one child, a male, had many rosettes in the tumors in both eyes. His sister had one eye enucleated and X-ray treatment to the second eye which was also ultimately enucleated with exenteration of the orbit for gross extension. The secondly enucleated eye had many rosettes in the tumor.

Comment

In the eye pathology laboratory of the Massachusetts Eye and Ear Infirmary the frequency of specimens containing retinoblastoma has varied little in the 53 years considered in this study despite the increase in total number of specimens of all types received in recent years. In this series, as in others which have been reported (Griffith and Sorsby,[3] Jain,[4] Davenport[1]), males have been involved somewhat more frequently than females among those with both bilateral and unilateral disease. No predilection for one eye or the other as site of onset of the disease has been demonstrated. Of the large unfollowed group of patients reported here 18.5 percent had bilateral involvement, but of the 79 cases adequately followed 25 percent were bilateral. The latter percentage approximates the one third bilateral involvement estimated by Reese,[5] and it seems not unlikely that had the large group of cases been adequately followed many more would have shown bilaterality.

In this series the average age of onset of symptoms was calculated and found to be 21.7 months. The average age at initial treatment is 26.6 months. These figures conform with general experience, and, indeed, are very close to those reported by Falls and Neel[2] who gave for their 37 cases a mean age at onset of symptoms of 19.9 months and at initial treatment of 25.4 months. The average age of onset of symptoms among the fatalities is 15.7 months. No significant difference exists between the fatalities and all cases as far as age of onset of symptoms is concerned. In several cases the tumor was undoubtedly present at birth, and the oldest patient thus far reported to have retinoblastoma (48 years) is included in this series. Rasmussen[7] has reported the tumor in a man of the same age.

The mean delay in treatment in this series is 4.9 months. When the series is broken down into those cases occurring before 1930 and since, it is apparent that in later years treatment has been earlier. Before 1930, 49 percent, and since, only 17 percent had symptoms longer than six months when first treated. In the adequately followed group 15 percent of the survivors and 44 percent of the fatalities had symptoms longer than six months before treatment was begun. Considering this difference between survivors and fatalities and also the greater percentage of three year (and hence probably permanent) cures since 1930 than before, prompt treatment of the disease when it is discovered would seem to play a significant role in the chances of effecting a cure in any given case. This is also reflected

in the degree of choroidal involvement, since 47 percent of those with choroidal involvement had symptoms longer than six months before treatment was instituted. The number of cases with extrascleral extension for which histories were obtainable is small and no definite trend is shown. Prompter treatment since 1930 is indicated by the decrease in involvement of the optic nerve by tumor beyond the lamina cribrosa, 41 percent before 1930 and 21 percent since. Reese[8] reports a similar decrease in recent years.

Examination of these specimens for the purposes of classification of the tumors revealed that there is no clear cut dividing line between the two groups, with and without rosettes. Even the tumors containing the fewest rosettes were likely to present some true rosettes in certain sections, while those with many usually had free areas. Accordingly, it is the belief of the authors that the use of a single name to describe all tumors of this general type is justifiable, and that variations in histologic picture are consistent with variations in the degree of differentiation of the same tumor. No effort has been made to determine the origin of the growth.

Tumors with many rosettes and tumors with few showed some similarities and some differences in behavior. In tumors appearing before the age of seven months many rosettes were likely. Thereafter they occurred with equal frequency. Optic nerve involvement was as common in highly differentiated tumors as in undifferentiated and of equal degree. Bilateral cases and unilateral cases showed the same histologic picture, and in several bilateral cases the tumor in one eye was moderately well differentiated and in the fellow eye undifferentiated. Of interest are several differences between the differentiated and undifferentiated tumors which will be discussed further below. These are the relative increase in differentiated tumors seen since 1930 (55 of 101 since 1930, and 28 of 76 before 1930) and the greater incidence of choroidal involvement and extrascleral extension in undifferentiated tumors.

Survival statistics indicate no difference between those with bilateral and those with unilateral disease. As noted previously the three year survival period has increased moderately since 1930 in the unilateral group (66.7 percent before 1930 and 79.5 percent since). No adequate comparison is possible in the bilateral group, although there is no reason to suspect that the same is not true. Data on treatment have not been given above but in general the initial treatment of all cases has been enucleation in the unilateral cases. Bilateral cases have all had enucleation of one eye and a variety of treatments has been used in second eyes—diathermy, X radiation, radon implantation, enucleation. Treatment of local recurrences has been universally a failure despite the method.

When the fatalities are viewed as a group and compared with the group of survivors certain generalizations are possible. These are that the fatalities tended to have a longer delay in obtaining treatment after symptoms were noted, had proportionally more frequent involvement of the choroid, in almost every case showed evidence of incomplete removal of the tumor, and tended markedly to have less differentiated tumors than the survivors. Invasion of the choroid by tumor has been held by others to indicate a poor prognosis. Meighan and Michaelson[5] state "those cases in which the choroid is invaded by the growth are more likely to show orbital secondaries," and Reese[8] has stated that extension into the choroid is a bad sign. In this series three of the fatalities failed to show microscopic evidence of extraocular extension yet had massive choroidal involvement. Furthermore, three cases with known generalized metastases had a similar involvement, and two of these are among those showing no microscopic evidence of extraocular extension. It appears likely that metastases occurred via the choroidal circulation in these two cases.

A higher mortality among those with undifferentiated tumors has been reported by Parkhill and Benedict.[6] In this series 7.5

percent of those adequately followed with well-differentiated tumors have died and 42.4 percent of those with undifferentiated tumors, a striking difference. It would seem, therefore, that the degree of differentiation is in large measure responsible for the fatal outcome. However, a different interpretation may be made. It has been shown that since 1930 tumors with many rosettes have become more frequent than before. It also was indicated that since 1930 patients tended to have symptoms for a shorter period of time before enucleation. With those who died the delay in treatment has been greater than in those who survived, and the same is true of those with choroidal involvement which was more common in undifferentiated tumors than in well differentiated. These tendencies suggest that the longer the tumors are present the more undifferentiated they become, so that the very few rosettes seen in tumors in fatalities is a consequence of the longer presence of the tumors before enucleation and not that the outcome is fatal because the tumors are more undifferentiated from the onset of the disease. Similar experience has not been reported elsewhere. If the suggestion is true the proportion of well-differentiated tumors should increase universally with more prompt treatment.

Many reports of isolated cases with strong familial incidence of retinoblastoma have appeared in the literature, but aside from the cases reported by Reese[8] no other group of survivors with children has been traced. He reported six survivors with 10 children, nine of whom had bilateral retinoblastoma. In our series are eight survivors with 16 children, three of whom have bilateral retinoblastoma. By combining the two groups there are 26 children of survivors of whom 12 have bilateral retinoblastoma, establishing the dominant character of the gene. Several of the children in this series are still quite young (the youngest is seven months of age), but since the disease manifests itself usually at birth or shortly after in children of survivors who have the gene, few, if any, of these under discussion are likely in the future to develop the tumor. No sex linkage is demonstrable in these few cases.

Summary

1. One hundred seventy-six cases of retinoblastoma are reported. Seventy-nine of these have been adequately followed.

2. Twenty-five percent of the 79 were bilateral.

3. The over-all tumor mortality of the 79 to date is 23.7 percent, 21 percent of those with bilateral disease and 23.2 percent of those with unilateral disease.

4. The three-year survival has increased from 66.7 percent before 1930 to 79.5 percent since in unilateral cases, and is 78.5 percent since in bilateral cases.

5. Eight survivors with 16 children of whom three have bilateral retinoblastoma have been discovered.

6. Comparing the period before 1930 with that since, the delay in treatment has been less, the tumors have been more differentiated, and optic nerve involvement has been less since 1930.

7. Extension of the tumor into the optic nerve was equally frequent and to the same degree in tumors with many rosettes and those with few or none. Choroidal involvement and extrascleral extension were more frequent in tumors with few or no rosettes than in those with many.

8. Choroidal invasion carries a bad prognosis.

9. Certain data suggest that the longer the tumors are present before treatment the more undifferentiated they become. It may be reasoned that the very few rosettes seen in tumors with fatal outcome is the consequence of longer existence of the growths before enucleation rather than that the lethal outcome stems from primary undifferentiation.

The contributions of clinical data by many ophthalmologists are gratefully acknowledged.

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VISUAL AIDS FOR THE PARTIALLY SIGHTED*

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A discussion of the use of magnifying lenses and other visual aids will properly start with the clarification of the term "magnification." One of the simplest of the generally known formulas of geometric optics, the so-called Newtonian magnification formula, reads as follows:†

$$m = \text{magnification} = \frac{i}{o} = \frac{f}{l_1}. \quad (1)$$

From this it is seen that optical magnification, the relation of image size i to a given object size o is (a) indirectly proportional to l_1, the distance between the object and the first or anterior focus of the lens, and (b) directly proportional to the (equivalent) focal length f of the lens in air. It follows that optical images become larger (a) if a given object is brought closer to a given lens or system of lenses, and (b) if weaker lenses (lenses with greater focal length) are used. It is well to remember that l_1, the object distance from the first focus, and l_2, the image distance from the second focus, vary indirectly. According to the Newtonian formula of image position,†

$$l_1 l_2 = f^2 = \text{constant}, \quad (2)$$

thus, image distances become short if object distances are large, and vice versa. From these two equations it will be understood that under the ordinary conditions of photography (or vision), when l_1 is usually much larger than f, the photographic (or retinal) image is much smaller than the object; it is also relatively close to the lens. Only when l_1 is smaller than f is the image actually magnified; it also gets quite far from the lens as l_1 becomes small. (The latter condition is encountered, for example, when the image of a slide is projected upon a screen in the lecture room.) However, whatever the value of l_1, the image of a given object will always be larger for any constant value of l_1 if f increases; that is, if a weaker lens is chosen.

Magnification being inversely proportional to lens power, evidently some other effect or property of lenses is referred to whenever it is stated in clinical practice that stronger lenses give better magnification or that a patient with poorer vision requires a stronger magnifying lens. As a matter of fact, the

* Read at the 26th annual spring conference of the Gill Memorial Eye, Ear and Throat Hospital, Roanoke, Virginia, April 9 to 11, 1953.

† For the geometric proof of the formula, see textbooks of optics, for example, A. Linksz, *Optics* (Grune and Stratton, New York, 1950), pp. 172f, 228f, fig. 127.

term magnification denotes different things in geometric and ophthalmic optics and magnification by lenses as defined by equation (1) is not a matter of primary clinical interest. In ophthalmic optics, the term magnification signifies a spreading of the retinal image (usually by some visual aid) upon a greater number of cones. If some visual aid increases the angular size of the retinal image measured from the second nodal point by two, the device is said to have $\times 2$ (100 percent) magnification. If the spread is less than $\times 2$, the percentual notation is usually preferred; for example, magnification is said to be 30 percent rather than $\times 1.3$ in aphakia corrected by spectacle lens. If magnification is greater, the notation $\times 2.5$ or $\times 4.0$ is used rather than speaking of magnification of 150 or 300 percent.

Since this spreading of retinal images has quite some clinical significance, it will be necessary to know what conditions and what properties of prescribed lenses or lens systems make it feasible. As, according to equation (1), the image produced by any given lens or by a system of lenses (such as the eye) increases with the shortening of l_1, the simplest method of spreading the optical image over a greater retinal area is obvious. All that has to be done is to bring the object of vision closer to the observer. This, of course, is not always possible. The astronomer cannot approach the stars in the sky, and the owner of a ticket in the 30th throw might find himself too far from the stage to enjoy the performance. In both of these instances, visual aids will be welcome, even if visual acuity is excellent and the visual aid needed will be of the type which spreads the retinal images of distant objects.

More often than not, however, objects can be readily approached or brought closer to the eye. Here some other problem may arise: Due to limitations in its optical properties, the eye may be unable to form sufficiently sharp or detailed images of such objects on its retina. (Were it possible to shift the retina backward, or to increase the power of the eye indefinitely by accommodation, there would be no limit to magnification of the retinal images by approach.) Visual aids might thus again be needed, even if visual acuity is normal, simply because the object of interest is too small, or its details too minute, to be seen even at reading or handling distance. The visual aid needed in this case will be one which either allows for greater approach than usual, or makes such approach unnecessary.

There is no essential difference between the visual aids used by people with normal visual acuity and the ones prescribed for the partially sighted. Whether visual acuity is normal or not (a) so-called telescopes are used to improve distance vision (when l_1 is large and cannot be shortened sufficiently or at all); and (b) loupes or microscopic magnifiers* serve the purpose of improving near vision (when the optical system of the eye has insufficient power to cope with the approach).

Telescopic visual aids

Telescopic visual aids for the partially sighted are small, compact opera glasses, constructed according to a principle discovered by Galilei. They consist of a positive objective lens of some power and a stronger negative ocular lens, the two being separated by the difference of their focal lengths. Their so-called magnifying power depends on this difference. To give an example: A +5.0D. objective has its second principal focus at 20 cm. Placing a −20.0D. lens, which has the focal distance of 5 cm., at 20−5 = 15 cm. from the first lens, a Galilean telescope has been constructed in which the relation of the

* It has become customary to call a certain type of near vision magnifiers "microscopic" lenses. Obviously, this is a misleading term. Microscopic lenses also spread the retinal image but through them objects are seen inverted. In these pages true microscopic magnification is not under consideration. Microscopic magnifiers are merely unusually strong plus lenses in which some of the aberrations have been corrected. They are worn in a spectacle frame (see later).

two focal lengths is $20/5 = 4$. The arrangement lets the first focus of the negative ocular lens* coincide with the second focus of the positive objective lens. The objective lens makes incident parallel rays converge and the ocular lens makes them parallel once more as they leave the telescope. Thus, optically speaking, the telescope has no focal distance and no power; it does not, in itself, form images which can be caught on a screen. Evidently, equation (1), the above quote magnification formula, cannot have any bearing upon its performance. If a certain magnification, a magnifying power of $\times 4.0$ is ascribed to the just mentioned telescope, something else is obviously meant by this term, namely, the spreading magnification *over* the retina, as explained before. The formula for this telescopic spreading magnification is†

$$m_s = \frac{f_1}{f_2} \qquad (3)$$

where f_1 and f_2 are the focal lengths of the objective and ocular lens, respectively. Evidently, the telescope just mentioned has a spreading magnification of $m_s = \times 4.0$.

If the statement (usually but falsely attributed to the astronomer, R. Hooke) is correct and two stars in the sky have to be one-minute apart in order to be seen as two separate stars, it follows that two stars which subtend an angle of only 0.25 minute at the second nodal point of the eye appear as but a single bright spot, no matter how "point-like" and accurate retinal imagery is. The angular separation of the two retinal images has to be quadrupled to let the two stars become visible as two. It is this type of spreading magnification, a spreading-apart of retinal images, which is accomplished by the Galilean telescope. If a parallel beam of rays is fed into the Galilean telescope of $\times 4.0$ magnification on the object's side, a parallel beam of rays leaves it on the other side. An emmetropic eye sees a distant single star through this telescope as sharply as without it.* However, if two parallel beams are fed into this telescope on the object's side (for example, from two different stars in the sky) and the two beams subtend an angle α with each other at the first nodal point of the eye and if the spreading magnification of the telescope is $\times 4.0$, then the images formed by these two beams on the retina will subtend a nodal point angle of $4\ \alpha$. Two stars which subtend a visual angle of only 0.25 minute at the second nodal point of the eye will just be seen separately if viewed through such a telescope.

Carrying over this principle into clinical optics, the following is evident: The 20/80 letters of the Snellen chart are four times wider and cast retinal images four times larger than the 20/20 letters. Thus, if a person has the visual acuity of only 20/80, he evidently is in need of four times larger retinal images than the normal to appreciate their normally visible, smallest details. Such a person will not read the 20/20 letters at 20-feet distance with the naked eye but will read them with the aid of the just mentioned telescope. In his case the telescope will be put to therapeutic use as a help to the partially sighted. In the first example, of course, the same visual aid was used to increase the visual performance of a person with normal vision.

The spreading magnification of a zero power telescopic system is, as stated above, determined by the relation of the focal distance of the positive objective lens to that of the negative ocular lens. Thus, in the telescope given in the above example, the magnification was found to be $\times 4.0$. The same $+5.0$D. objective with a -10.0D. lens at 10 cm. from it will only give $20/10 = \times 2.0$ spreading magnification. A $+20.0$D. objec-

* The first focus of a negative lens is on the side opposite to the entrance of rays.

† For the geometric proof of the formula, see textbooks of optics, for example, W. H. A. Fincham, *Optics*, Hatton Press, London, 1939, ed. 3, p. 170, fig. 118.

* In fact, it sees it brighter since the telescope increases the density of rays besides.

tive and a −40.0D. lens placed at 2.5 cm. from the first lens also make a telescope of ×2.0 spreading magnification and so do a +2.0D. objective and a −4.0D. ocular, separated by 25 cm., and so forth. The power of these three telescopes is the same, though the lenses used are quite different.

There is no theoretic limit to magnification by this principle and no end to the variations by which the same magnification can be achieved. By using a weak objective and a strong ocular and separating them widely, any desired amount of magnification can easily be obtained. To have, for example, ×10 magnification, a +20.0D. objective could be chosen and a −200.0D. lens (if there is such a thing) placed at 4.5 cm. from it; but it will certainly be simpler and cheaper to choose a +1.0D. objective and a −10.0D. ocular separated by 90 cm. Constructing a telescope for astronomical or nautical purposes, length will be of no objection. Neither will be the smallness of the visual field scanned with a long tubular instrument. But if an opera glass is to be useful, it will have to be relatively short. Thus, in an opera glass either part of the magnification will be sacrificed or lenses of greater power used.

Telescopic visual aids worn in a spectacle frame will have to be even more compact than the opera glass. To make them effective, lenses of high dioptric power will have to be chosen. And since in a telescopic visual aid a wide field is desirable, the diameter of the objective lens will have to be large. However, powerful lenses of larger diameter have considerable weight and the controlling of their so-called aberrations is not easy. Besides, the apparent motion and the disturbing closeness of magnified objects create some added problems. Designers of telescopic visual aids for the partially sighted have therefore found that, for clinical purposes, the production of units of greater magnification than about ×2.0 is not feasible. The telescopic visual aids best known in this country are the ones made by the Kollmorgen Optical Company in Brooklyn, and by the Univis Lens Company. The Kollmorgen magnifying lenses are available in two strengths: one with ×1.7, the other with ×2.2. The former is flatter and has a more conventional appearance and a field of 35 degrees, whereas the latter is more bulky and has a field of only 22 degrees for its greater magnifying power. The Univis telescopes have only ×1.5 and ×1.75 magnification and much smaller fields. But their smallness and light weight makes it possible to cement these telescopes into the center of an ordinary distance lens which enables the wearer to look around his telescope. The new Feinbloom telescope is light and has a large field and pleasing appearance. Its magnification is ×2.2. All of these telescopes are rather expensive. The Eggers twin spectacle is light and collapsible and since the separation of the two lenses is ca. 10 cm., it is made up of relatively weak lenses. Thus, aberrations are only minor. Its magnification is ×2.0 and it is quite inexpensive*

Since telescopic spectacles discharge parallel beams of rays, people with a refractive error will have their own refractive correction worked into the system. If the telescopes are standard (like the Kollmorgen type), the refractive correction is added to its back end in form of a separate attachment lens. In the Feinbloom lens, the refractive correction seems to be incorporated into the back lens. This gives the wearer a personally fitted telescope, an advantage as far as weight is concerned, but also an added expense.

A person with the visual acuity of, for example, 20/100, wearing a therapeutic telescope of ×2.0 magnification, will read the 20/50 line of the Snellen chart at 20 feet. While this is an achievement, many of the partially sighted find telescopes of only limited use. People with as little visual acuity as 10/200 prefer to get along without them. With a fairly intact visual field they can move about safely indoors and out without assistance (Lebensohn, 1951). Telescopic

* Most of these data were taken from a paper by J. E. Lebensohn (Telescopic Spectacles, The Sight-Saving Review, *21*(4), 204, 1951).

lenses are only useful for these patients when they watch television or a movie, or whenever all they want to observe is concentrated into a fairly small and stable area. More shall be said later about the use of the telescopic lens for near vision.

Near vision aids

The common devices for improving visual performance for near are the time honored loupe, the reading addition, and what nowadays is called microscopic magnifier. A loupe is quite in common use when objects which are to be studied at close range are too small to be recognizable. A botanist, naturalist, or philatelist will make use of them even if his vision is excellent and he has not yet become presbyopic. Loupe magnification is achieved by interposing a convex lens between the material to be studied and the eye, with the material within the focus of the lens. The lens produces an erect, virtual, and enlarged image and the eye eventually views (and accommodates for) this larger, but farther image, the apparent object. Since, according to equation (1), magnification depends on the relationship of f to l_1, the virtual image can be magnified any degree (at least theoretically), even by weak lenses. All that is necessary is to keep l_1 small by bringing the object just inside the focus of the magnifying loupe. In this case, however, l_2 becomes large too.* Thus, the virtual image will get so very far from the viewing eye that the spreading magnification of the retinal image will still be limited. Loupe magnification has its limitations. The following examples 1 to 5 will show what can be achieved by the use of a loupe.

A lens of +12.5D. ($f = 8$ cm.) is held at six cm. from a stamp which is at 18 cm. from the eye; l_1 is two cm. (example 1). From equation (1), the magnification of the virtual image will be $8/2 = 4$. However, from equation (2) it can be seen that the virtual image is at $l_2 = 64/2 = 32$ cm. from F_2 (the second focus at the ocular side of the loupe), or 24 cm. from the lens, or 18 cm. farther from the eye than the actual locus of the stamp. Since the stamp itself is 18 cm. from the eye, the fourfold optical magnification of the virtual image, seen at the apparent distance of 36 cm,* offers only ×2.0 actual spreading magnification of the retinal image. Half of the magnifying effect is lost.

The same ×2.0 spreading magnification of the retinal image could, of course, also be achieved by simply bringing the stamp closer to the eye, to a distance of nine cm. In the latter case, however, the eye has to accommodate (or carry a reading addition) for nine cm., while the loupe permits to view the object of interest under the same visual angle but at the apparent distance of 36 cm. Enabling the eye to view an object with lesser accommodation (or reading addition) is one of the less apparent, though significant secondary effects of a loupe. Another advantage lies in the better "handling distance." It will certainly be easier for the ophthalmic surgeon to "handle" an eye at 18 cm. distance than at nine cm., while receiving retinal images of the same detailedness in both instances.

It would, however, be wrong to believe that a spreading magnification of ×2.0 is inherent in any setting in which, as in the above example, a +12.5D. loupe is held at six cm. distance from the viewed object. The position of the latter from the eye has to be considered. If the stamp is held at the distance of nine cm. from the eye† (example 1a) and the same loupe is held at the same distance from the stamp, optical magnification will again be fourfold and the apparent distance 18 cm, beyond the actual position of the object. But this will mean an apparent distance which is three times the actual distance of the object and the additional retinal

* This will be evident from equation (2).

* Obviously an accommodation of 100/36= (about) 2.75D. is required to see the stamp and a presbyope needs an appropriate reading addition.

† In this case, of course, retinal images of twice the size are available, to begin with.

spreading magnification achieved by the loupe will only be ×4/3 or 33 percent. The beneficial effect of the loupe in this case will rather be due to its secondary action, to its allowing for accommodation at the apparent distance of 27 cm., while the object really is at nine cm. In this example, the retinal image will be larger than in example 1 by 33 percent, but the handling distance will be worse, nine instead of 18 cm.

In the case that the same loupe is held closer to the eye, at seven cm. distance from the stamp which is held at its original distance of 18 cm. (example 2), l_1 becomes one cm. and the virtual image is enlarged eight times. However, the distance of the virtual image also increases considerably. It is found from equation (2) that l_2 (the distance from F_2) becomes 64 cm. Thus the virtual image is 56 cm. beyond the lens, 49 cm. beyond the actual locus of the stamp, and 49 + 18 = 67 cm. from the eye. The virtual image, though eight times larger than the object, is about 3.7 times farther from the eye. The actual spread of the retinal image is not more than about ×2.15. This is somewhat better magnification than ×2.0. Should the loupe be brought closer to the stamp, for example to a distance of four cm. (example 3), the optical magnification of the virtual images will be twofold. At the same time, the virtual image will be four cm. beyond the actual locus of the object, at the apparent distance of 22 cm., 1.22 times farther from the eye than the actual object. Part of the magnification will thus be lost again. The actual spreading of the retinal image will only be ×1.63 and the needed accommodation will be more than 4.0D.

It can be seen from these three examples that the effective magnification caused by a loupe varies if the loupe is moved. It becomes somewhat greater as the loupe is brought further from the object. At the same time, less accommodation, or reading addition) is required. Of course, there are limitations to this movement. A loupe can be brought practically in touch with the object, in which case l_1 approaches f; or it can be brought almost as far from the object as f, in which case the virtual image approaches infinity.

Two further examples will illustrate this point. If in the just described setting l_1 is made, for example, 7.9 cm., if the loupe is only one mm. from the stamp (example 4), i will be $\frac{7.9}{8} o$; in other words, the virtual image will hardly be magnified at all and it will only be 8/7.9 of one mm. displaced which is a displacement of next to zero. In general, there will be no appreciable magnification effect if a loupe is brought too close to an object. If, on the other hand, l_1 is made, for example, one mm., the object almost being in the first focus of the loupe (example 5), i will become 80 times o. However, the virtual image will be 80 × 7.9 = 632 cm. from the loupe and another 10.1 cm. from the eye. Thus the actual (practically maximum) spreading magnification at the retina will be not more than about ×2.2, certainly no significant gain over the magnification achieved in examples 1 or 2. There will, however, be no need for accommodation and none for a presbyopic reading addition.

Somewhat greater magnification is achieved under otherwise unchanged conditions by using a stronger lens. With a +25.0D. lens and l_1 = 1 cm. (the loupe has to be held three cm. from the stamp), the virtual image becomes magnified four times, as in example 1. However, since the image is nine cm. behind the locus of the stamp or 1.5 times farther from the eye than the object's actual distance, the spreading magnification of the retinal image will be 4/1½ = ×2.66. This is better than the ×2.15 magnification achieved with the f = 8 cm. hand magnifier under the same conditions (example 2), but there is certainly not enough gain to warrant a +3.75D. reading addition for a presbyope and the increased weight and aberrations of a strong loupe sufficiently large for purposes like reading. Strong loupes are usually made small in diameter

and thus offer a useful field only if the examiner gets them rather close to his eyes. (Linen counters, jewelers' loupes are examples of this type.) In strong lenses, f is short; l_1, by definition, must always be shorter than f; thus, the material to be examined must also be brought close. This, in itself, increases the retinal image. It is furthermore evident from equation (2) that if f is short, l_2 will not become unduly long even for as short an l_1-value as, for example, one of two mm. Thus the virtual image will not get too far from the observer's eye and less of its magnification will be lost. But with all this effectiveness, their field will still be too small for reading.* Obviously, loupe magnifiers have their limitations as reading aids. Still, within their limitations they serve extremely well.

A point to be considered once more is that of an appropriate reading correction for the presbyope. When viewing the printed page with the setting given in the first example (actual distance of print 18 cm.), the apparent distance becomes 36 cm. Thus a roughly +2.75D. reading spectacle will be needed. It should be evident that the distance of six cm. between page and loupe will have to be kept rigidly if the subject is a presbyope wearing a reading correction. Under the conditions given in the first and second example, the shift of the loupe by only one cm. pushed the virtual image as far as 67 cm. from the eye, a distance for which the reading addition of +2.75D. is certainly not suited any longer. (As a matter of fact, presbyopes who use loupes do better with lesser reading additions. Theoretically, they might do without them entirely, as bringing the reading material into, or near, the focus of the loupe pushes the virtual image as far as infinity.) Inevitable rigidness of the arrangement in the case of the presbyope with reading correction is one of the difficulties with using a loupe. In his case stronger loupes work better when mounted on a tripod or some other device which holds the lens at some specified distance from the print. Only weak lenses make satisfactory hand loupes. Their dioptric power will seldom exceed +6.0 to +8.0D.* Lenses of +5.0 to +10.0D. power, mounted on headbands,† are often used by ophthalmic surgeons, dentists, jewelers, and so forth. Leaving the hands free, they give useful magnification at a convenient apparent distance. Of course, subjective adjustment has to be made for the discrepancy between apparent and manipulating distance. This, however, is easily achieved because the subject soon suppresses the feeling that his fingers are not at the distance at which they appear to be. Besides, these weak loupes can be fitted for both eyes and this way one can enjoy full, even improved, stereoscopic vision.

The principles elaborated above are equally valid in case loupe magnification is used as a visual aid for the partially sighted. A presbyope whose visual acuity can be optimally corrected to 20/80 must have the letters of the 20/20 Snellen line, or of the equivalent 14/14 reading chart text, enlarged fourfold. Only then will he be able to recognize them. It would be wrong, however, to conclude that because a patient's best visual acuity is 20/80 he is in need of ×4.0 magnification. A patient with 20/80 vision need not be able to read the 20/20 line at 20 feet in order to, for example, watch television. He also does not have to be able to read the 14/14 lines of the AMA reading chart, a print equivalent to that found in mail order catalogues. In clinical practice, the *amount* of magnification should fit the *purpose* of magnification.

Holding, for example, the Lebensohn reading chart at the specified distance of 14

* The useful field of a loupe can never be larger than its diameter.

* Since hand magnifiers are plus lenses, they also affect the vergence of rays, making diverging rays less divergent. Younger presbyopes who (usually for social reasons) do not want to be seen with reading glasses, often resort to a magnifier when looking up a telephone number, and so forth. Their accommodation is usually still sufficient to bring a slightly magnified and slightly recessed virtual image into sharp focus on their retina.

† The Magni-focuser of the Edroy Products Company is one of this type.

inches (35 cm.), a patient with visual acuity best corrected to 20/80 is only able to read the 12-point lines (the print used in children's books). To read them, however, he only needs the regular reading addition of +2.75D. and no separate visual aid. Only if he wants to read the telephone directory, the 6-point lines, is additional visual aid to be given because, in order to see this font, an equivalent of 20/40 or 14/28 vision is needed. Clearly, a patient with optimal vision of 20/80 needs ×2.0—not ×4.0—magnification to read the telephone directory. There are several ways to achieve this and loupe magnification, is certainly the easiest.

The author uses a simple rule which, employing any loupe, helps to achieve ×2.0 spreading magnification at some preferred or specified apparent distance. Assumed that a presbyope has a +2.75D. reading addition requiring him to hold print at the distance of 14 inches (35 cm.) and that he also has a +12.5D. loupe at hand. The focal distance of this loupe is eight cm., half the focal length is four cm. By bringing the printed matter to the distance of 35 − 4 = 31 cm. from the eye (actually from his eye-glasses) and by holding the loupe another four cm. from the print, at 27 cm., the spreading magnification of the retinal images will be ×2.0 and the apparent distance of the print the required 35 cm. for which the reading addition just fits. Having at hand a +6.25D. loupe the focal distance of which is 16 cm., the page will have to be held eight cm. nearer than 35 cm. and the loupe another eight cm. from the page in order to achieve the same result.

According to Lebensohn, 20/50 equivalent vision suffices for reading newspaper. Thus a patient whose visual acuity is 20/80 evidently needs even less than ×2.0 magnification for this purpose. The last mentioned +6.25D. hand magnifier (a commercially available six inch loupe has about this power) and a reading addition of about +2.5D. is amply sufficient.

Even with visual acuity of only 20/160 it should not be impossible to read a newspaper or the telephone directory using a reading lens and a +6.25D. loupe. At the reading distance of 14 inches (35 cm.) and with the proper reading lens (+2.75D.), a patient with the visual acuity of 20/160 will only see the 24-point print of the Lebensohn chart. He will need another ×4.0 spreading magnification of his retinal images to be able to read the telephone book. To do this by loupe alone is not feasible. He will have to sacrifice both reading distance and field. First of all, he will have to be satisfied with the apparent distance of one half of 14 inches, about 17.5 cm. This in itself magnifies the retinal images by ×2.0. To get the rest of the magnification, another ×2.0, by loupe, he will have to hold the paper at about 9.5 cm. from his eye and to bring the +6.25D. loupe another eight cm. inside of this distance, almost up to his nose. This might be feasible. But it is simpler to use, for example, a +10.0D. or +12.5D. loupe and hold the paper five or four cm. inside of 17.5 cm. and the loupe another five or four cm. closer, in accordance with the just mentioned rule. Even if some field is lost and aberration gained, the print and the loupe do not have to be held that close.* Evidently, the reading addition in the patient's own glasses will have to be +5.75D. to make him read at the apparent distance of seven inches (17.5 cm.), whichever loupe he uses. Still, not all patients will be satisfied with this type of solution although it is about the cheapest that can be offered.

Should the patient with the visual acuity of 20/160 be equipped with a telescopic lens for distance, then, with proper reading addition to the telescope, near vision also can be improved. Besides, the patient's hands will be free. The telescopic visual aids of the above mentioned commercially available types are

* It should be noted from these last two examples that, in order to see print at a certain apparent distance (retinal image size unchanged), both the actual printed page and the loupe can be held *farther* if the loupe is *stronger*. This is the advantage of using a stronger loupe.

fit for the specific purpose of spreading the retinal images by about ×2.0 in case parallel rays are fed into them at the objective's side. If near objects are to be viewed through this type of lens system, with their fixed separation of positive and negative elements,* a near vision cap must be put in front of the objective of the proper strength to transform the divergent rays coming from nearby objects into parallel beams. Holding thus the printed page 14 inches (35 cm.) in front of the objective of the telescope and fitting a +2.75D. lens on top of the objective lens, the patient will read proper size print without accommodation. Assumed that the power of the telescope is ×2.0, the retinal image of any print will be twice the size it were would the patient read the printed page at a distance of 14 inches (from his eyeglasses) with a +2.75D. reading addition only. Thus, a patient with 20/160 optimal visual acuity who with the reading addition of +2.75D. reads 24-point print at the standard distance of 14 inches, will read 12 point print with the combination of a ×2.0 telescope and the +2.75D. reading addition, a near vision cap slipped over the telescopic lens. To read the 6-point print, the telephone directory, another ×2.0 magnification is needed. This is best achieved by approaching the print to half of the 14-inch distance and by increasing the power of the near vision cap to the double of +2.75D.† To have his retinal images of the print in the telephone directory appear the same size without the aid of the ×2.0 telescope, this patient would have to bring the print up to a distance which is cut by another half (as close as 3.5 inches) and, if presbyopic, use a reading addition of four times +2.75D., a so-called microscopic lens.

Thus, there are three different ways, at least theoretically, to make a presbyopic patient with 20/160 visual acuity read 6-point print. It can be done (1) with a moderately strong reading addition and a loupe; (2) with a telescopic lens and near vision cap; and (3) with a strong reading addition, a so-called microscopic lens. In the first case (using a reading addition of +5.75D. and a loupe of +12.5D.), the print has to be at a distance of 13.5 cm. from the spectacle lens and the loupe four cm. in front of the print. In the second case (taking a ×2.0 telescope and a +5.75D. cap), the print is to be held at a distance of 17.5 cm. from the lens. In the third case (using a reading addition of +11.5D.), the print has to be held at a distance of about 8.5 cm. from the spectacle lens.

Neither loupes nor telescopes are therefore actually needed to enable the partially sighted to read. Increased reading addition will also suffice. Strange as it may seem at first thought, the simple presbyopic reading addition is not different in principle from what, by a more sumptuous trade name, is called a microscopic lens. The distinction between the two is largely arbitrary. By common usage, lenses up to +4.0D. are called reading additions. Stronger ones are called microscopic magnifiers. A ×2.0 microscopic magnifier is essentially a +8.0D. lens, permitting the reader to bring the print twice as close as a +4.0D. reading addition; a ×4.0 magnifier is a +16.0D. lens, and so forth. (That the now commercially available microscopic magnifiers are especially designed to reduce weight, astigmatism of oblique pencils, and so forth, is significant but outside the scope of the present elementary discussion.)

Dr. Alfred Kestenbaum, in this author's

* In the opera glass, the separation of objective and ocular can be varied and it is possible therefore to get nearby objects into focus by changing its length. For the same reason, opera glasses can be used by myopes or hyperopes without correcting distance lenses: Myopes will shorten, hyperopes lengthen their opera glasses to see better.

† The commercially available near vision caps come in the strength of +2.0D., +4.0D., +6.0D., +8.0D., and so forth. The somewhat odd values given in this discussion stem from the fact that the author uses the AMA and Lebensohn reading charts with their standardized distance of 14 inches as the basis of the present exposition. The reader will easily adjust these values when experimenting with the actual telescopes whose magnification value is seldom ×2.0 (they vary, according to make, between ×1.5 and ×2.2) and the available near vision caps.

knowledge, was the first to advocate the planned use of stronger than usual reading additions for the partially sighted patient, planned in terms of feasible, or desired, visual achievement. It is not necessary, generally, to aim at a visual performance which is equivalent to 14/14; seldom will a partially sighted need to see the 3-point print of a mail order catalogue. *The proper reading addition has to be planned in terms of the size of print which it is to serve.*

Kestenbaum's computation method* is easiest explained with reference to Snellen's near visual acuity chart. This is marked in meters and therefore lends itself more readily to calculation in diopters. Furthermore, it is advisable to transform the distance visual acuity data into fractions with the smallest denominator. Visual acuity of 20/80 (6/24) is thus called "1/4," and so forth. The following example can be considered. A patient with 20/80, or 1/4, vision desires to read the letters of the near visual acuity chart marked "1M."† Since the designation "1M" means that the small lower case letters of the font have an angular height of 5′ when held at the distance of one m., a patient with ¼ vision will need his retinal images enlarged four times and bring the "1M" print four times closer than one m., that is, up to 25 cm. If he has no refractive error and no accommodation, he will need a +4.0D. lens to receive sharp retinal images. Should the patient's visual acuity be 20/160, or 1/8, the "1M" test type will obviously have to be brought eight times closer to his eyes than one m. to enlarge the retinal images of these letters to recognizable size. One eighth of one m. is 12.5 cm. and thus a +8.0D. addition (or a ×2.0 microscopic magnifier) will be needed to form sharp images of these letters on the retina. A patient with 20/200, or 1/10, vision will hold the print at 10 cm. and need a +10.0D. reading lens.

Comparing the letters of the test types with the near vision test charts of Lebensohn, it will be noticed that the font under the "1M" marking is of a size somewhere between 8 and 9 point;* thus the just discussed patients should be able to read magazine print (9 point) at the specified respective distances. They will not read newspaper print at these distances and with the calculated lenses but will read a typewritten letter comfortably. If people with reduced vision intend to read newspaper print, the "0.75M" text should be aimed at. Since normal eyes see these lines at 0.75 m. (in a rounder number 0.8 m.) and with an appropriate reading addition if they are presbyopic, the patient with 20/80 vision will have to bring them four times closer, to about 20 cm., the patient with 20/160 vision eight times closer, to about 10 cm., and the patient with 20/200 vision 10 times closer to about eight cm. The first patient will have to wear a reading addition of +5.0D., the latter two will need +10.0D. and +12.0D., respectively (a microscopic magnifier of ×2.5 and ×3.0).

A well-balanced, well-motivated younger, or even older, person with 20/200 vision will put up with the inconvenience of 10 cm. reading distance if it enables him to read magazines (9 point) and college books (10 point), both of them larger than the above considered "1M" font, and even the 8-cm. reading distance which lets him read newspaper (7 point). Some, especially older people with more rigid habits, will be quite unhappy with such arrangement. In their case the refractionist should not be so ambitious and aim at first only at the text under the "2M" mark of the Snellen chart. A patient with 20/200, or 1/10, vision will see this at 2/10 meter distance and only needs a reading

* I learned of this method while attending a course of Dr. Kestenbaum's in Vienna in the summer of 1936.

† The Test Types published by the American Optical Company (manufacturer's number 1981) are construed on Snellen's principle and marked in this manner.

* It is unfortunate that the just mentioned reading chart carries only metric values. The practitioner will better put additional marks next to the different fonts: "Magazine print" to "1M," "Newspaper print" to "0.75M," and so forth.

lens of +5.0D. A comparison with Lebensohn's chart shows this type print to be about 15-point size. Certainly, the number of books printed in such large type is limited. It is the print used in young children's books. The mentally more alert patient will soon learn that the scope of available reading material can only be increased at the expense of reading distance. If he cannot reconcile himself at all with the short reading distance, he should be advised to change to a loupe. If a loupe is at hand, the reading addition computed by Kestenbaum's method is cut in half and the needed doubling of the size of retinal images achieved by the method described earlier in this paper. The same visual result is then achieved with (a) a +10.0D. lens and a reading distance of 10 cm., and (b) with a +5.0D. reading lens and a +12.5D. loupe, holding the print four cm. (half the focal length) closer than the apparent reading distance of 20 cm. (i.e. at 16 cm.) and the loupe another four cm. closer, that is at 12 cm. from the eye (the spectacle lens). Patients will vary in their preference of one or the other method, the former usually offering the larger field. With the newer, specially designed microscopic lenses which, as mentioned, are free from many of the aberrations of simple strong plus lenses, this larger field can now be more effectively used. Against Feinbloom's microscopic lenses only their exorbitant price can be held. Bechtold's lenses, at least as good in optical performance, are within the reach of the ordinary citizen.

To find out what to aim for and what reading lens to use, there is another, possibly even simpler, method than Kestenbaum's. Lebensohn's near vision chart is to be used at 35 cm. (the 14 inches required by the AMA). A presbyope needs a reading addition of +2.75D. at this distance. With this reading lens and the visual acuity of 20/20 (14/14), he can read 3-point print (mail order catalogues, classified advertisements); with a visual acuity of (20/40 (14/28), he can read the telephone directory; with the visual acuity of 20/50 (14/35), he reads newspaper print; and with the visual acuity of 20/70 (14/49), he will read magazines, textbooks, and typewritten letters. It is quite easy to double this performance if visual acuity is poorer or the patient aims at better performance. For this the reading distance is cut in half (17.5 cm.) and the reading addition doubled (+5.75D.). Thus, a patient with 20/40 vision will read the advertisements; one with 20/80 vision the telephone directory; with 20/100 vision the newspaper; with 20/150 vision typewritten letters. Here, however, individual cases will have to be considered. An exceptional patient will aim at better performance. In his case the reading distance must be cut and the power of the reading addition increased, or reading addition and loupe will have to be combined. More often, however, a patient will rather give up reading the telephone directory or the advertisements and choose to read at 25 cm. rather than 17.5 cm., using a +4.0D. addition. Sometimes it is a good policy to prescribe two or three different sets of lenses and to explain to the patient that they can be used for different purposes. A patient might even use a weaker reading lens and a loupe at one occasion, a strong reading lens at the other, for the same purpose. Variety and variability is desirable. Gradually, most patients learn to use the microscopic lens and to read even small print at a very close range.

Summary

Visual aids for the partially sighted are not in principle different from visual aids for the normal. They are of two types: (a) aids for distance vision; (b) aids for near vision.

For distance vision, telescopic visual aids (miniature Galilean telescopes) are the best feasible. Useful retinal magnification will usually not exceed ×2.0 or ×2.2. Their field is limited.

For near vision, three types of visual aids are usable: (1) hand magnifiers or loupes; (2) telescopic lenses with reading caps; and

(3) strong reading glasses, so-called microscopic lenses. The advantages and disadvantages of all three types are discussed.

A loupe can be used both with and without presbyopic reading correction. In the first case, print and loupe have to be held at specified distances. In the latter case, it is most advantageous to keep the print in, or near, the anterior focus of the loupe.

The partially sighted need not be corrected for 20/20 distance visual acuity or 20/20 equivalent near vision. Proper reading lenses are to be planned in terms of the available residual vision and in terms of the size of print the partially sighted wants, or needs, or is able to read.

Several practical rules are given. They should help the practitioner in the choice of the most appropriate reading aid.

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FURTHER INVESTIGATIONS ON THE VIRUS OF BEHÇET'S DISEASE*

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Behçet[1] was the first to describe, in 1937, a morbid entity presenting three symptoms, namely, iridocyclitis with hypopyon, aphthous lesions in the mouth, and ulcerations on the genitalia. However, since 1898, other investigators had observed the same manifestations, but it was Behçet who first reported that these symptoms are the basic manifestations of an independent disease and, therefore, this new syndrome was referred to as Behçet's disease both in Europe and America. However, there are a few investigators who, although not openly, object to the use of this name. According to Cavara[2] of Rome, Behçet, in describing the symptoms of the disease, did not mention iridocyclitis, whereas, it can easily be noted that the most important manifestation of the cases presented by Behçet was recurrent iridocyclitis. Adamantiadis[3] of Athens insists on calling the disease a "symptom complex," reporting that he had observed these symptoms prior to Behçet. However, Adamantiadis failed to point out, as the investigators before him, that these manifestations are the cardinal symptoms of an independent disease. Behçet was the first definitely to demonstrate that these three symptoms occur in a distinct syndrome and even attempted to report the cause to be viral.

* From the Ziya Gün Institute for Research in Trachoma, University of Istanbul. Supported by a grant-in-aid awarded by the National Council to Combat Blindness, Inc.

Clinical picture

In describing his first cases, Behçet reported the three symptoms already mentioned; however, as the number of the cases increased, it was observed that there are certain other manifestations as well, primarily erythema nodosum. In addition, furunculosis, pyoderma, abscesses, signs of papulopustular dermatitis, swelling of the joints, rheumatic pains, orchitis, hydroceles, and phlebitis may also accompany the disease. These manifestations usually appear in association with a high fever. It is also not too rare to observe signs of meningoencephalitis.

Etiology

In previous studies, I have proved the etiology of the disease to be viral. In experi-

ments on more than 30 patients, I could not succeed in producing an experimental disease in rabbits by using the material taken from the anterior chamber and the aphthous lesions of patients. Thus, depending upon the clinical conviction that the inflammation first starts in the optic nerve and retina, I attempted to isolate the agent from the subretinal exudate and corpus vitreum and, by using the same method, succeeded in isolating a virus presenting the same characteristics from each of three patients.

Summary of preliminary investigation

My first investigation was presented before the French Ophthalmologic Congress held in Paris on May, 1952, and was published in the proceedings of the meeting.[4] The English translation was published in the March, 1953, issue of The American Journal of Ophthalmology (36:301-315, 1953).

Properties of the new virus

Size

The virus readily traverses a double-padded Sietz filter and, according to the electron microscopic photographs, the size of the particle is about 100 mμ.

Cultivation

The new virus grows well on the chorioallantoic membrane of a developing chick embryo and produces white circular plaques. After being adapted to the chorioallantoic membrane, the virus generalizes and brings about the death of the embryo in three to five days. Our strain had been passed serially 20 times, its virulence for the embryo was greatly increased, while the virulence for mice was stationary. Following the inoculation in the allantoic cavity, the virus proliferates in the endodermal lining cells of the sac and appears in the fluid which is usually collected after 42 to 48 hours.

Experiments on animals

Mice are readily infected, especially by the cerebral route when they develop fatal encephalitis after an incubation of three to four days. The virus can also be inoculated into young mice peritoneally or subcutaneously. Experiments have also been made on rabbits. Following an intraocular inoculation, a mild chorioretinitis develops in a few days. In rare instances, the disease travels to the brain and may induce a fatal encephalitis. Guinea pigs are infected peritoneally and, following injection, a fatal hemorrhagic lobar pneumonia develops.

Immunity

Since recurrent attacks are so common, one would not expect Behçet's disease to confer any significant immunity. Tests on selected subjects show that the sera of the patients regularly contain antibodies, which are absent in normal people. Antibodies develop in convalescent and experimentally infected animals. The sera of such patients and animals will neutralize the infectivity of the virus when tested by inoculation of mice cerebrally or on the chorioallantois. Complement-fixation can also be demonstrated between antisera and antigens prepared from infected brain tissue or chorioallantois and allantoic fluid. It has been found that antibodies are usually absent in the sera of the patients recovering from the infection. Complement-fixing antibodies develop in experimentally infected animals after about three weeks. Every attack tends to give a short-lived (about one month) immunity but subsequent attacks tend to be milder.

New studies

Proceeding with this work, I decided to concentrate my investigations on determining where the virus can be found. The reports of 20 cases observed for this purpose are given below:

Case 1

Recep Arik, a man, aged 40 years, noted aphthous lesions in his mouth and ulcerations on his genital organs in 1947. At the same time, inflammation started in his right eye which remained for two months. During this

period, his left eye was operated because of high tension. The general condition of the patient looked well for three months; however, after this calm period, ulcerations on his genitalia and pains in his eyes started again. The patient states that, this time, his eye was filled with exudate. The condition recurred at intervals of three months.

On examination, at the time of admission, the right eye was normal; vision was 10/10. Blepharospasm and ciliary injection in the conjunctiva were present in the left eye. The cornea was edematous, the anterior chamber was shallow, the iris was edematous and atrophic. At the 12-o'clock position, the old area of iridectomy could be seen, the iris was attached to the lens, which had opacified. The fundus and vitreous could not be seen. The vision was reduced to counting fingers at half a meter and the ocular tension was very high.

Five days after hospitalization, the patient suddenly became feverish; he suffered pain with pressure; tiny papulopustular lesions (fig. 1) appeared on his legs (erythema nodosum). Next day, a hypopyon (fig. 2) had formed in the left eye. In four days the fever subsided, the pain eased, and the hypopyon disappeared.

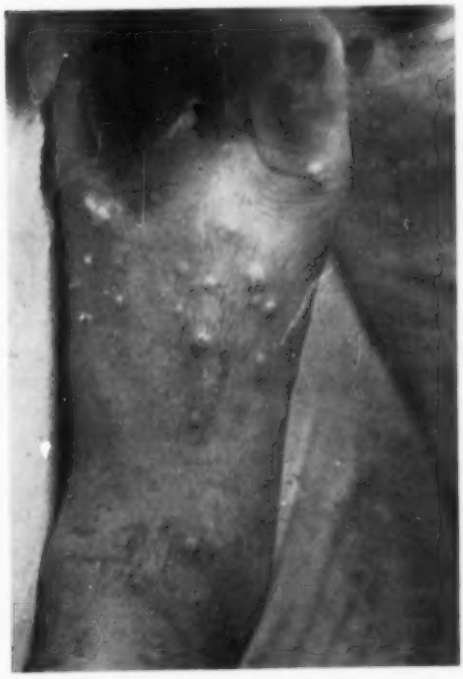


Fig. 1 (Sezer). Case 1. Tiny papulopustular lesions appeared on his legs.

Fig. 2 (Sezer). Case 1. A hypopyon formed in the left eye on the sixth hospital day. Four days later, the fever subsided, the pain eased, and the hypopyon disappeared.

Case 2

Hasan Sahbaran, a man, aged 33 years, complained of pains in his left eye since 1947. Almost coincident with these pains, he observed aphthae in his mouth and ulcerations on his genital organs. These usually healed in five to 10 days but the disease occurred at intervals of two to three months. During this period, his left eye was enucleated because of unbearable pain. Three months after enucleation, he started to complain of his right eye. The patient states that he had typhoid in 1944 and acute polyarticular rheumatism in 1946.

At examination, the pupil of the right eye was irregular; iris pigments were seen on the lens; precipitations of various sizes in triangular forms were found behind the cornea; vision was reduced to counting fingers at one meter. The fundus could not be seen. The temperature of the patient became elevated on the 24th day of hospitalization. A hypopyon formed in the right eye, aphthae appeared in the mouth and on the scrotum.

CASE 3

Ihsan Silahtar, aged 29 years, a man, states that the disease started three years ago in both eyes, together with aphthae in his mouth and ulcerations on his genitals. The patient adds that five years ago he had rheumatism.

In his examination, sequellae of iritis were seen in both eyes. Since the vitreous was cloudy, the fundus could not be seen. Vision of the right eye was 2/10 and that of the left 1/10. Instillations of cortisone were started and after 10 days, the patient complained of acute pains; a hypopyon and aphthae of the mouth appeared and the joints were swollen. Since the left eye was in a state of absolute glaucoma, it was enucleated and sent to Dr. Michael Hogan of San Francisco for histopathologic examination. Typical viral lesions were formed on chorioallantoic membrane with exudate taken from this eye by puncture.

CASE 4

Nadiye Kahraman, a woman, aged 20 years, complained of aphthae in her mouth and on her tongue, numerous papulopustules on her legs and arms, and pains in her eyes. The disease first started in her right eye and the crises occurred at intervals of one month for two years, after which she lost her right eye. About a year ago, her left eye began to ache.

In her examination, pupillary occlusion and a hypopyon were observed in the right eye, the vision was zero. In the left, there were iris pigments on the lens in the anterior capsule. In the fundus, the papilla was edematous and yellowish in color. The papillar vessels could be seen with difficulty. The posterior pole of the retina was edematous and a white sheath had formed around the retinal arteries (periarteritis). Some of the arterioles were occluded. There were hemorrhagic spots and exudate in the retina. Vision was reduced to counting fingers at one meter.

In the examination of her blood the following were observed: Leukocytes: 12,000 mm.^{3}; erythrocytes: 3,400,000/mm.^{3}; with segment 61 percent, lymphocytes, 24 percent, monocytes three percent, eosinophiles three percent, stab nine percent, hemoglobin 67 percent, and index nine percent. Wassermann and Kahn reactions were found to be negative. Sedimentation: one-half hour, 45 mm.; one hour, 90 mm.; two hours, 132 mm.

Intradermal reaction to old tuberculin gave negative results. In her radiographic examination, both hili were distended. The sinus was normal. The patient's fever ranged between 37 to 37.5°C. Once it became elevated to 39°C. and a hypopyon was formed. When cortisone treatment was started, the fever of the patient increased to 39°C. in three days and all the manifestations of Behçet's disease appeared. Thus cortisone treatment was stopped and the general condition of the patient improved.

CASE 5

Mustafa Genis, a man, aged 40 years, reported that, about eight years ago, first his left eye and then his right started to ache. The illness disappeared in four to five days but appeared at intervals of approximately two months. His vision became reduced at each recurrence. At the same time, aphthae appeared on his tongue and genitals. The patient describes an illness with high fever which resembled typhoid.

On examination, both eyes revealed pupillary occlusion. In the right eye there were pericorneal injection, a hypopyon in the anterior chamber, and severe pains. The left eye was calm. The fundus could not be seen in both eyes. Vision was reduced to counting fingers at a meter in the right and 1.5 meters in the left. Aphthae in the mouth and on scrotum and signs of numerous tiny papulopustular lesions on different parts of the body were observed. The temperature of the patient was 38°C.

CASE 6

Mehmet Aldemir, a man, aged 26 years, stated that his right eye has been affected

for a year. The illness started with aching and his vision became cloudy. These signs disappeared within three to four days but recurred at intervals of one month. Prior to the eye manifestations, the patient observed aphthae in his mouth and erosions on his scrotum. Since then, his joints have been swollen.

On examination, tiny iris pigments were seen on the lens of the left eye and there was a posterior synechia at the 6-o'clock position. The vitreous was cloudy, the pupil irregular, and there was exudation in the peripapillar area. The inferior temporal artery was thoroughly covered with a white sheath. Vision was finger counting at 2.5 meters. The right eye was normal, vision was 10/10.

Case 7

Jirayir Asador, a man, aged 25 years, states that about two and a half years ago, tiny aphthae started to appear in his mouth and on his tongue and tonsils. Almost at the same time his joints and knees became swollen and reddish. These manifestations disappeared within five to 10 days but appeared again after two months.

On examination, aphthous lesions, with sharp outlines and yellowish color, which were very painful, were observed in his mouth, on his tongue, and glottis. Wide and numerous ulcerations were present on the scrotum. The bulbar conjunctiva was congested but the iris and fundus showed no abnormality. The temperature of the patient ranged between 37.5 to 38.5°C.

Case 8

Sulhi Cabi, a man, aged 28 years, reported that, three years ago both of his eyes became congested and started to ache but these symptoms disappeared within 10 days, starting again after one and a half months. His vision decreased with each recurrence. Coincident with the eye manifestations, aphthous lesions appeared in his mouth and on his scrotum.

On examination, remnants of pigment were observed on the surface of the lens of the right eye, the corpus vitreum was cloudy, periphlebitis was present in the vein from the superior nasal quadrant to the fundus, and areas of hemorrhage were observed. Vision was 2/10. In the left eye, the conjunctiva was congested. The cornea was cloudy and there was a hypopyon in the form of a line in the anterior chamber. The papilla was attached to the lens and the fundus could not be seen. Vision was finger counting at two meters.

Case 9

Salahattin Çavuş, a man, aged 27 years, for three years had had aphthous lesions in the mouth and on the scrotum and iridocyclitis in both eyes. The illness recurred at intervals of one month.

Case 10

Ismail Baka, a man, aged 40 years, stated that, about one and a half years before hospitalization, his joints were swollen and he started to complain of severe pains. Following this, his right eye became congested and cloudy. The illness continued for 15 days, after which the eye returned to normal. The disease recurred at intervals of one month and the eye became congested when each crisis developed. His left eye suddenly started to ache six months later and vision was cloudy. He also observed aphthae on his scrotum and in his mouth, although these were fewer during the eye manifestations.

On examination were seen deep vascularization in the cornea, precipitation in the anterior chamber, and pupillary seclusion. In the right eye, a hypopyon was present in the form of a line. Vision was reduced to perception of hand movements in the right eye and in the left to counting fingers at half a meter.

Case 11

Ruben Çevik, a man aged 33 years. Ulcerations started to appear on the skin of his

testis 16 years ago. These healed in 20 days but recurred at intervals of about one to two months. Six years after the disease started, his joints began to be swollen. This, like the lesions, disappeared in 15 to 20 days but recurred. The patient was usually feverish. Thirteen years after the onset of the disease, his right eye became congested and was painful. This also improved in a week and recurred once in a month. The patient stated that at each eye manifestation, a hypopyon was present.

On examination, vision was reduced to light perception. The patient was admitted to a mental hospital several times because of high agitation. At his examination, he was still nervous, agitated, and complained of not being able to sleep.

The examination of his right eye revealed ciliary congestion, atrophy of the iris, and pupillary seclusion. Vision was zero. The left eye was normal.

Case 12

Nesli Konbay, a woman, aged 23 years. About seven years ago, lesions started to appear on her genitalia, first in the form of red spots. The spots became white in color within two to three days and erupted. At the same time, she observed aphthae at the corners and on the inner surface of her mouth, on her tongue, and glottis. At the first crisis, all the manifestations disappeared in four days but recurred after two months. This condition appeared with each menstruation period and continued for six years, at the end of which time her eyes became swollen and congested and the other signs suddenly appeared. Her vision was cloudy and both of her eyes started to ache painfully. Photophobia was observed and the anterior chamber showed inflammation. The pains appeared only twice in her left eye but her right eye ached at every crisis and her vision was zero.

On examination, the right eye revealed ciliary injection, the anterior chamber was cloudy, and the iris was atrophic and vascularized. Pupillary occlusion also was present. Vision was zero in the right eye, posterior synechias were observed in the iris. In the fundus, the boundaries of the optic nerve were not clear. Vision was 8/10 in the left eye.

Cases 13 and 14

Agop Asador and Mihran Asador are brothers of Jirayir Asador (Case 7). Six months before Jirayir's illness, the disease appeared in Agop and a month later in Mihran. In both patients, the disease started with rheumatic pains, the joints became swollen, and the fever increased to 39°C. Aphthae which were yellow in color appeared in the mouth and ulcerations were seen on the scrotums.

On examination, no other manifestation was observed but the ulcerations on the scrotum and the aphthae in the mouth. The eyes of the patients were normal.

Case 15

Mahmut Ergör, a man, aged 28 years, states that the disease started two years ago. His ankles became swollen and aphthae appeared in his mouth and on his scrotum, disappearing in 10 to 15 days but recurring within one and one-half months. During each crisis, the patient noted that his eyes were congested but his vision was normal.

On examination, only the symptoms in ankles, mouth, and scrotum were present. No manifestations were observed in the eyes. The temperature of the patient was 38.5°C.

Case 16

Narin Çankaya, a woman, aged 28 years said that the disease started about four years ago with fever, rheumatism pains, aphthae in the mouth and on the scrotum. Two months after the onset of the disease, her left eye began to ache.

At examination, ciliary congestion was observed in the left eye. The cornea was cloudy; there was a hypopyon in the anterior chamber and pupillary seclusion. The

right eye was normal. There were numerous aphthae in the mouth and tiny ulcerations on the small labia.

Case 17

Simon Alufmedina, a man, states that 12 years ago his joints became swollen and his illness was diagnosed as polyarticular rheumatism. These rheumatic signs appeared at intervals of six months. About two years age, he had uveitis and was treated in Italy but the disease kept recurring at intervals of one and a half months. At the last crisis, he observed aphthae in his mouth and on his scrotum and a hypopyon had formed in the anterior chamber.

On examination, pupillary seclusion was observed in the right eye and there was a hypopyon. There were three aphthae in the mouth and two on the scrotum.

Case 18

Rifat Çelbeşlioğlu, a man, aged 50 years, states that the disease started 20 years ago with recurring feverish crises of rheumatism and aphthae in his mouth and on his scrotum. During the last six years, his eyes began to ache. But these manifestations disappeared in a short time, to appear again within two months.

On examination, together with aphthae in his mouth and on his scrotum, iridocyclitis with hypopyon in the right eye was observed. In the left eye, there were posterior synechias in the pupil and the fundus could not be seen. In the right eye, there were signs of periarteritis in the retinal vessels.

Case 19

Turgut Mengu, a man, aged 24 years, complains of aphthae in his mouth and on his genital organs which appeared three years ago. His joints were usually swollen and his eyes were sometimes congested. These symptoms usually lasted for 10 days and then disappeared but were seen again each month.

Case 20

Lamia Orbay, a woman, aged 28 years, complained of aphthae in her mouth and on her genital organs for five years. Two years ago, her right eye began to ache. The pains and aphthae usually subsided in a week but recurred at intervals of one and half months. During the crises, her joints were swollen and her fever increased.

At examination, pupillary occlusion was observed in the right eye together with iridocyclitis and hypopyon. There were three aphthae on the mouth mucosa and one on the tongue. There was an ulceration filled with exudate on the small labia.

New experiments

It is well known that viremia occurs early in the course of many systemic viral infections, and the present study was undertaken to determine whether the infective agent is present in the blood of Behçet cases. Accordingly, blood was obtained from 20 patients, the histories of whom have just been described, and attempts were made to recover the infectious virus from the blood stream after various intervals. Observations on the complement-fixating antibody titrate during these intervals were also made.

Material and Methods

Twenty volunteer patients participated in this study. All individuals were suffering from Behçet's disease and were hospitalized for examination and treatment. All patients were carefully observed for new attacks of the disease in order to obtain the blood at proper intervals in every case. The blood samples (5.0 ml) were obtained from the arm and were collected in sterile test tubes and then allowed to clot. The serum was aspirated and preserved. The clot, after being immediately chilled, was ground in saline 1/10 and inoculated into the chorioallantoic membranes of 12 to 13-day-old embryos. Pocks (fig. 3) were produced on all the membranes after 48 hours of incubation

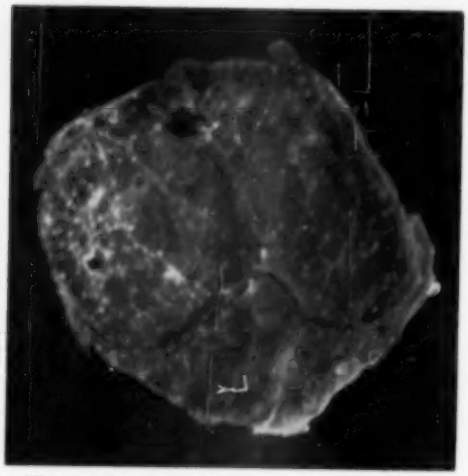


Fig. 3 (Sezer). Pocks on chorioallantoic membrane, produced by inoculation of the patient's blood.

at 36°C. and the membranes were removed and examined for the presence of specific lesions. In appearance, these were similar to the changes which were produced by the eye material reported in previous experiments. These lesions were also passed serially. A suspension of the virus on chorioallantoic membrane was lyophilized and was sent to Dr. G. Rake of Philadelphia for examination with the electron microscope. Particles can be seen in Figure 4. Animal inoculation experiments were likewise successfully carried out. The infection was passed through a number of mice serially.

Results

Table 1 summarizes the essential data for each patient.

Accordingly, all samples of blood taken in the first and second weeks of illness produced typical lesions on chorioallantoic membrane. A comparison of the number of lesions developing on the chorioallantoic membrane indicates that more than 90 percent of virus was removed from the circulatory system in approximately the third week of every new attack of illness.

Development and persistence of complement-fixating antibodies between attacks

The complement-fixation tests were studied with sera taken at varying intervals. The serum samples were obtained at one-week intervals between two attacks of the illness to afford evidence of possible divergences in the development of antibodies. In Table 1, the complement-fixating antibody titrates of 20 patients indicate complement-fixation titrates usually rose to a maximum within three weeks from the onset of symptoms and remained at that level for several days before a gradual decrease in titrate became apparent.

Elimination of the virus from the patient's body

After the presence of the virus in blood stream was determined, the same experiments were repeated with the urine of the patients. The urines of 20 patients were filtered through a Sietz filter and five cc. were inoculated into guinea pigs intraperitoneally. For each patient, five animals were selected and, of the 100 guinea pigs, 60 were dead within 10 to 30 days. At necropsy, lobar pneumonia, swelling of the

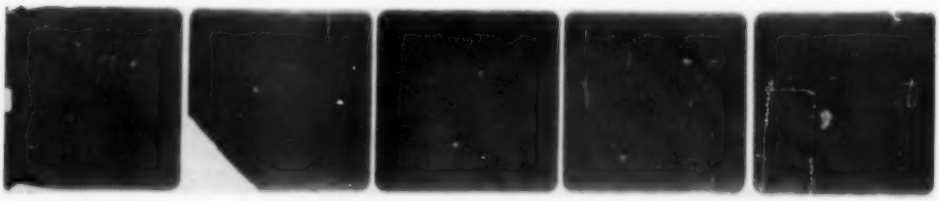


Fig. 4 (Sezer). Electron microscope photograph of virus isolated from the patient's blood.

TABLE 1

SUMMARY OF ESSENTIAL DATA ON 20 PATIENTS

Case	Patient	Number of Virutic Pucks on Chorioallantoic Membrane Inoculated with Blood			Complement Fixation		
		First Week	Second Week	Third Week	First Week	Second Week	Third Week
1	R.A.	DD 50 50 35	D 50 30 30	? ? 20 10 5	1/64	1/128	1/128
2	H.S.	DDD 60 50	D 30 25 25 20	? ? ? 5 8	1/28	1/64	1/128
3	I.S.	DD 70 50 30	D 25 20 10 8	? ? 15 10 2	1/64	1/128	1/128
4	N.K.	D 50 35 50 20	15 10 8 ? ?	— — — —	?	1/64	1/64
5	M.G.	DDD 50 50	D 50 40 30 30	? ? — 10 5	1/16	1/64	1/128
6	M.A.	DD 70 50 40	D 40 30 20 10	? ? 20 10 0	1/16	1/32	1/64
7	J.A.	DDD 70 50	DD 50 30 30	30 30 20 10	1/8	1/64	1/128
8	S.C.	DD 50 40 30	? 30 30 20 10	? ? 20 20 10	1/32	1/128	1/128
9	S.Ç.	DD 50 50 40 40	D 50 50 30 10	? ? — 20 10	1/8	1/16	1/128
10	I.B.	DDD 50 50	DD 50 40 30	— — — 20 10	1/16	1/16	1/64
11	R.Ç.	DDD 70 50 50	DD 50 50 10	— — — 10 10	8	8	1/128
12	N.K.	D 50 40 40	30 20 20 20 10	— — — ? 5	1/64	1/128	1/265
13	A.A.	DD 50 50 50	40 30 20 20 20	— — — 10 5	1/32	1/128	1/256
14	M.A.	DDD 60 50 50	50 40 50 20 20	— — — 20 10	1/8	1/8	1/64
15	M.E.	DD 50 40 40	40 30 30 20 20	— — 30 20 10	1.16	1/32	1/64
16	N.Ç.	DDD 60 50 50	40 40 30 30 30	— — 40 20 20	1/32	1/32	1/64
17	S.A.	DDDD 60 50	50 50 40 30 30	— — 30 30 20	1/8	1/64	1/32
18	R.Ç.	DD 40 40 30	30 30 20 20	— — 20 20 20	1/16	1/16	1/64
19	T.M.	DDD 40 40	40 30 20 20 20	? ? 30 30 20	1/64	1/64	1/64
20	L.O.	DD 50 30 30	40 30 30 20 10	? ? 40 30 30	1/16	1/32	1/32

D: Death.
?: Doubtful lesions.
—: No lesions.

kidneys, and congestion were observed in all of the animals.

Although it was not possible to make, at various intervals, inoculation to guinea pigs of urine from each patient (as was done with the cultivation of the blood and complement-fixation reaction), it was observed that the occurrence of death among the guinea pigs was closely related to the degree and date of the symptoms in the patients. This observation indicates that the amount of virus in the urine is related to its presence in the blood.

One of the guinea pigs which died at the end of experiment, was closely examined and its liver, kidneys, and spleen were removed. After being ground under sterile conditions, peritoneal inoculations were made from each of the organs to two guinea pigs. The remaining organs were also histopathologically examined. After six days, one of the guinea pigs to which liver emulsion was injected died. A specimen of the lungs of this animal was ground in tyrode and the following inoculations were made: 0.1 cc. peritoneal inoculation to one to five mice; 1.0 cc. peritoneal inoculation to two to four guinea pigs. Seven days after inoculation, one of the guinea pigs died and the mice started to show signs of illness. Autopsy was performed on one of the guinea pigs and the histopathologic examination showed that the alveoli were distended in the lungs and serum and masses of erythrocytes were present in the cavities of most of them. There was perivascular cell infiltration around all the vessels.

Pneumonia was diagnosed on the histopathologic examination of mice. Two cc. of the emulsion prepared from the lungs of mice were inoculated peritoneally to five guinea pigs, three of which died at the end of seven days.

These experiments clearly indicate that the infectious agent is specific.

HISTOPATHOLOGIC EXAMINATION OF A GUINEA PIG WHICH DIED OF THE DISEASE

The histopathologic report of one of the guinea pigs which died of the disease is given in detail:

The lungs. In two separate specimens, hyperemia in the septal capillaries and a patchy type of perivascular infiltration are observed. Most of the alveoli are filled with alveolar histiocytes; some with erythrocytes and alveolar histiocytes (focus of bronchopneumonia, fig. 5). Atelectasis and distention due to emphysema are also present.

The heart. There is hyperemia in the capillaries. Tiny vacuolization is observed in the fibers of the heart muscles which indicates extensive fatty degeneration in the sarcoplasma.

The liver. Protoplasma is clear in the cells of the parenchyma but, in some, the nuclei are hyperplastic, dark purple in color, and contain cloudy and gross granules. The portal vein and the central vein are dilated.

The surrenal. The cortex and the medullary cells are rich in lipoid. Hemorrhage is observed in the tissue cells around the surrenal.

The kidneys. The glomeruli contain many erythrocytes, are edematous, and enlarged. There is cloudy swelling in the tubulis contortis and hyperemia in the capillaries.

Diagnoses. The lungs: Lesions of bronchopneumonia. The heart: Hyperemia, tiny points of fatty degeneration. The liver: Extensive fatty degeneration, congestion. The surrenal: Rich in lipoid. The kidneys: Hyperemia, cloudy swelling.

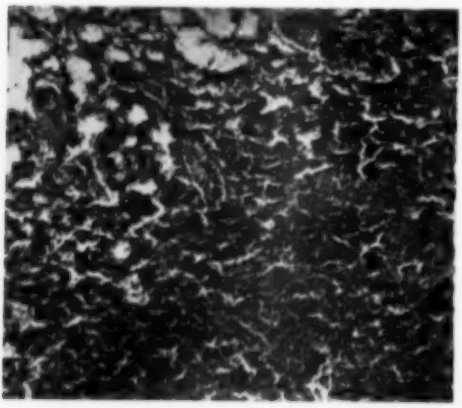


Fig. 5 (Sezer). Section of lung of guinea pig dying of the disease. Most of the alveoli are filled with alveolar histiocytes; some with erythrocytes and alveolar histiocytes. Note the focus of bronchopneumonia.

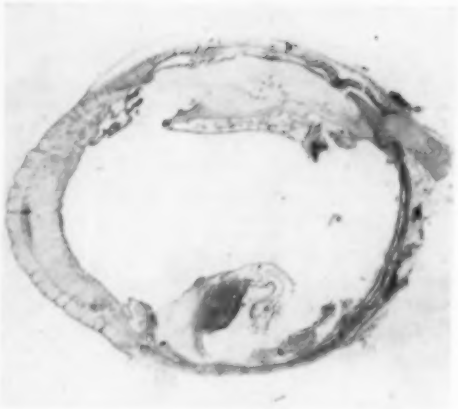


Fig. 6 (Sezer). Eye of cortisone-treated rabbit examined histopathologically by Dr. Michael J. Hogan of the Francis I. Proctor Foundation of the University of California School of Medicine.

Experimental disease

In order to produce experimental Behçet disease in the eyes of rabbits with the virus isolated from the blood, infected chorioallantoic emulsion was inoculated into the corpus vitreum of the rabbits. After repeated inoculations, ciliary congestion, mild iritis, and cloudiness in the corpus vitreum were observed in the eyes of the rabbits and, in some, foci of exudate were seen. Some of the rabbits were subjected to cortisone treatment before and after experimental inoculation and, in all of them, uveitis with hypopyon developed with the characteristic manifestations. One of the eyes (fig. 6) was examined by Dr. Michael J. Hogan of San Francisco and his report is given below in his own words.

Clinical diagnosis: Behçet's disease

History

Virus was inoculated into the eye of this rabbit and injections of cortisone were made before and after the inoculation. When an endophthalmitis,

Fig. 7 (Sezer). Section from eye shown in Figure 6. The anterior chamber is filled with a serofibrinous exudate which has clotted.

together with the clinical manifestations, was observed, the eye was removed.

GROSS EXAMINATION

Examination shows a fibrinous exudate in the anterior chamber containing a small clot. There is a cheesy subretinal exudate.

MICROSCOPIC EXAMINATION

The cornea shows some inflammation with loss of epithelium, edema, and round-cell infiltration between the lamellae. This inflammation is most marked at the periphery of the cornea. The anterior chamber is filled with a serofibrinous exudate which has clotted (fig. 7). This exudate contains some red blood cells and chronic inflammatory cells.

The iris and ciliary body show a very intense inflammation, particularly the ciliary body in the region of the pars plana and some of the posterior processes (fig. 8). The inflammation has extended through the interruptions in Bruch's membrane to be continuous with exudate in the adjacent vitreous.

The choroid shows a diffuse intense inflammation which, at some points, becomes focalized and tremendously thickened. In the focal areas of inflammation numerous eosinophils are observed and there are many phagocytes, chronic inflammatory cells, and occasional mast cells. Considerable edema fluid is present. An occasional giant cell seems to surround some degenerating tissue. No specific organisms can be found in any of these focalized lesions. Occasional clumps of phagocytes are seen in these areas.

The retina is adherent to the exudate at some points and shows extensive atrophy and degeneration. There is evidence of a fairly severe retinitis secondary to the severe chorioiditis. The primary inflammation, however, is in the choroid. There

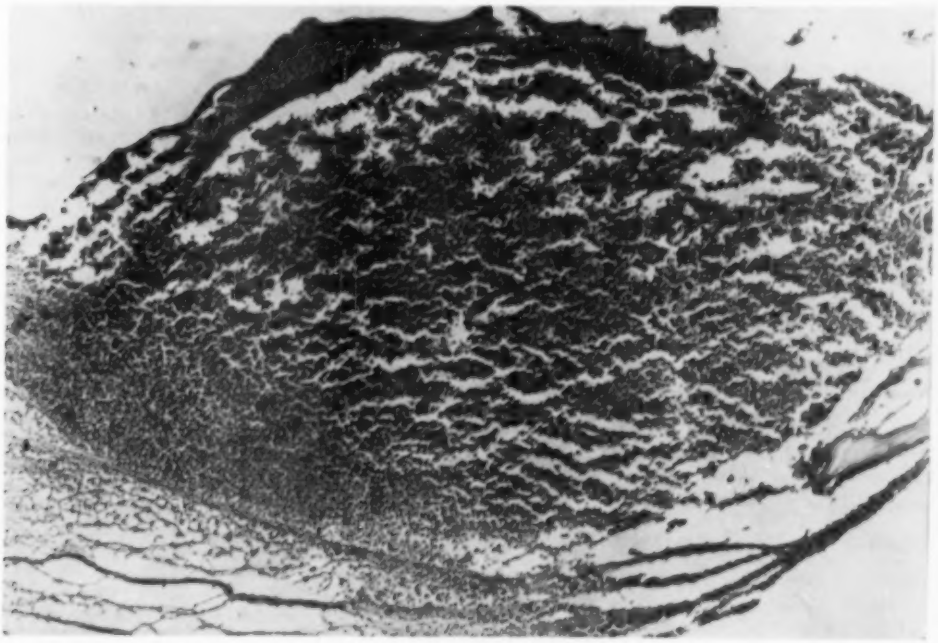


Fig. 8 (Sezer). Section from eye shown in Figure 6. The iris and ciliary body show intense inflammation, particularly the ciliary body in the region of the pars plana and some of the posterior processes.

The lungs. In two separate specimens, hyperemia in the septal capillaries and a patchy type of perivascular infiltration are observed. Most of the alveoli are filled with alveolar histiocytes; some with erythrocytes and alveolar histiocytes (focus of bronchopneumonia, fig. 5). Atelectasis and distention due to emphysema are also present.

The heart. There is hyperemia in the capillaries. Tiny vacuolization is observed in the fibers of the heart muscles which indicates extensive fatty degeneration in the sarcoplasma.

The liver. Protoplasma is clear in the cells of the parenchyma but, in some, the nuclei are hyperplastic, dark purple in color, and contain cloudy and gross granules. The portal vein and the central vein are dilated.

The surrenal. The cortex and the medullary cells are rich in lipoid. Hemorrhage is observed in the tissue cells around the surrenal.

The kidneys. The glomeruli contain many erythrocytes, are edematous, and enlarged. There is cloudy swelling in the tubulis contortis and hyperemia in the capillaries.

Diagnoses. The lungs: Lesions of bronchopneumonia. The heart: Hyperemia, tiny points of fatty degeneration. The liver: Extensive fatty degeneration, congestion. The surrenal: Rich in lipoid. The kidneys: Hyperemia, cloudy swelling.

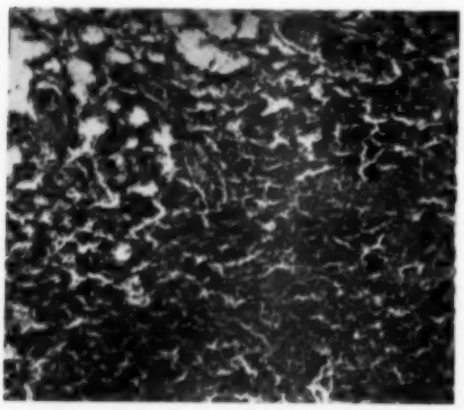


Fig. 5 (Sezer). Section of lung of guinea pig dying of the disease. Most of the alveoli are filled with alveolar histiocytes; some with erythrocytes and alveolar histiocytes. Note the focus of bronchopneumonia.

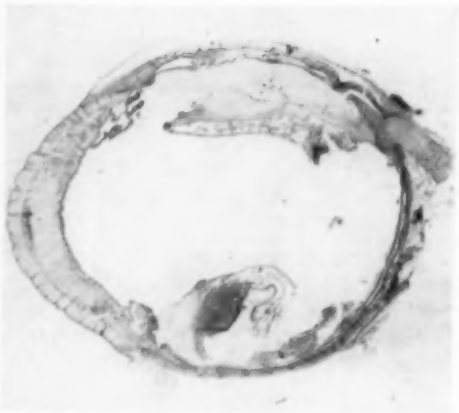


Fig. 6 (Sezer). Eye of cortisone-treated rabbit examined histopathologically by Dr. Michael J. Hogan of the Francis I. Proctor Foundation of the University of California School of Medicine.

Experimental disease

In order to produce experimental Behçet disease in the eyes of rabbits with the virus isolated from the blood, infected chorioallantoic emulsion was inoculated into the corpus vitreum of the rabbits. After repeated inoculations, ciliary congestion, mild iritis, and cloudiness in the corpus vitreum were observed in the eyes of the rabbits and, in some, foci of exudate were seen. Some of the rabbits were subjected to cortisone treatment before and after experimental inoculation and, in all of them, uveitis with hypopyon developed with the characteristic manifestations. One of the eyes (fig. 6) was examined by Dr. Michael J. Hogan of San Francisco and his report is given below in his own words.

Clinical diagnosis: Behçet's disease

History

Virus was inoculated into the eye of this rabbit and injections of cortisone were made before and after the inoculation. When an endophthalmitis,

Fig. 7 (Sezer). Section from eye shown in Figure 6. The anterior chamber is filled with a serofibrinous exudate which has clotted.

together with the clinical manifestations, was observed, the eye was removed.

GROSS EXAMINATION

Examination shows a fibrinous exudate in the anterior chamber containing a small clot. There is a cheesy subretinal exudate.

MICROSCOPIC EXAMINATION

The cornea shows some inflammation with loss of epithelium, edema, and round-cell infiltration between the lamellae. This inflammation is most marked at the periphery of the cornea. The anterior chamber is filled with a serofibrinous exudate which has clotted (fig. 7). This exudate contains some red blood cells and chronic inflammatory cells.

The iris and ciliary body show a very intense inflammation, particularly the ciliary body in the region of the pars plana and some of the posterior processes (fig. 8). The inflammation has extended through the interruptions in Bruch's membrane to be continuous with exudate in the adjacent vitreous.

The choroid shows a diffuse intense inflammation which, at some points, becomes focalized and tremendously thickened. In the focal areas of inflammation numerous eosinophils are observed and there are many phagocytes, chronic inflammatory cells, and occasional mast cells. Considerable edema fluid is present. An occasional giant cell seems to surround some degenerating tissue. No specific organisms can be found in any of these focalized lesions. Occasional clumps of phagocytes are seen in these areas.

The retina is adherent to the exudate at some points and shows extensive atrophy and degeneration. There is evidence of a fairly severe retinitis secondary to the severe chorioiditis. The primary inflammation, however, is in the choroid. There

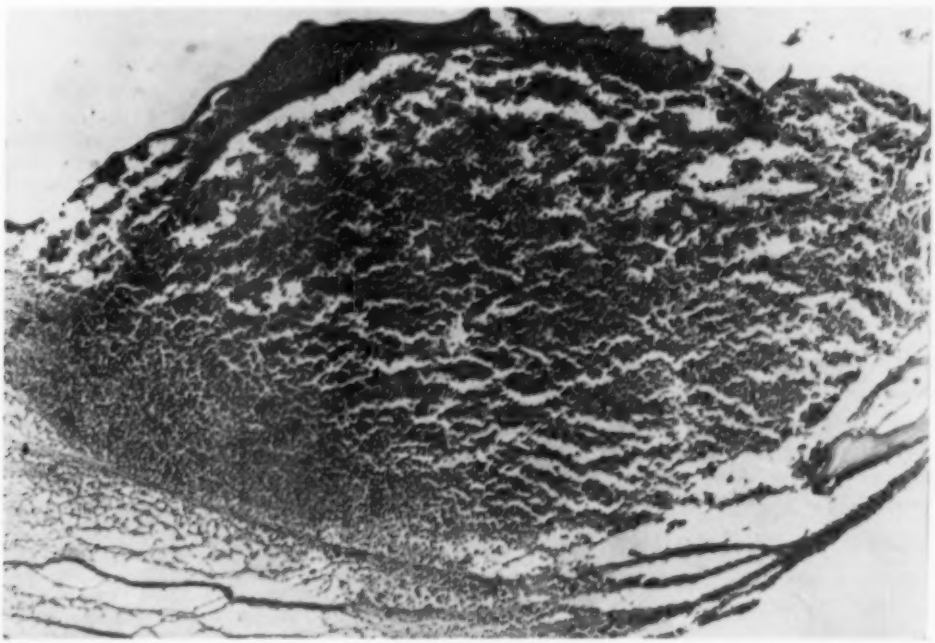


Fig. 8 (Sezer). Section from eye shown in Figure 6. The iris and ciliary body show intense inflammation, particularly the ciliary body in the region of the pars plana and some of the posterior processes.

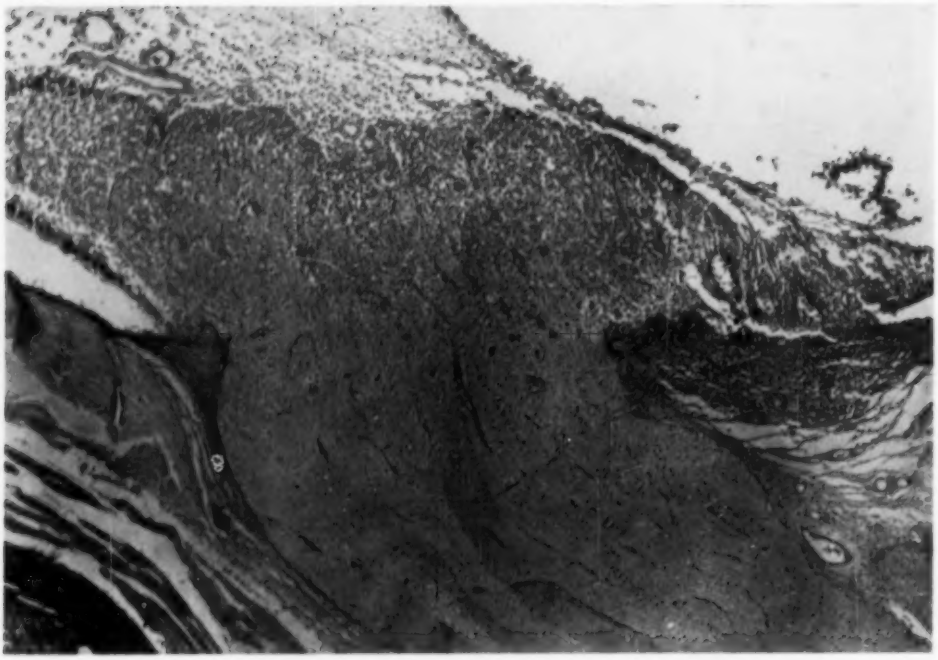


Fig. 9 (Sezer). Section from eye shown in Figure 6. There is marked edema of the disc with inflammation and swelling.

is marked edema of the disc with inflammation and swelling (fig. 9). The vitreous contains considerable exudate, some of which is necrotic. A combination of red cells and chronic inflammatory cells is seen. The lens was lost from this eye and is not visible in any of the sections.

DIAGNOSIS

Endophthalmitis, due to Behçet's disease.

HISTOPATHOLOGIC EXAMINATION OF DISEASED HUMAN EYES

The eyes of two patients, whose histories were given above, were enucleated because of pain due to secondary and absolute glaucoma. The results of the histopathologic examination of these eyes are given below in the report of Dr. Michael J. Hogan:

CASE 1

CLINICAL DIAGNOSIS

Behçet's disease.

HISTORY

The patient had Behçet's inflammation of the uveal tract and secondary absolute glaucoma. The eye was removed because of great pain.

GROSS EXAMINATION

A left eye measuring 26 by 25 by 26 mm. The cornea is hazy; the anterior chamber is shallow; the lens is cataractous. Horizontal calottes. There is a total retinal separation to a central strand by fresh hemorrhage.

MICROSCOPIC EXAMINATION

Conjunctiva. The conjunctiva is the site of intense inflammation. One of the rectus muscles was sectioned long, and this tissue is folded back over the conjunctiva. The muscle fibers show a very intense inflammation and, in some places, the necrotizing process is extreme.

Cornea. The cornea is folded and slightly depressed and irregular because of the scar tissue within the eye. The epithelium is thinned. Bowman's membrane is intact. There is a peripheral keratitis with vascularization.

Limbus. Schlemm's canal is patent. The trabecula is inflamed and fibrosed.

Sclera. There is a scleritis. Tenon's capsule, posteriorly, is inflamed.

Anterior chamber. The angle is closed by peripheral anterior synechias. There are central anterior synechias and the anterior chamber, between the peripheral anterior synechias and the central anterior synechias, is filled with fibrinous exudate. There is a fibroblastic pupillary membrane which is adherent, anteriorly, to the cornea and,

posteriorly, to the capsule of the forward-displaced lens.

Iris. The pupillary and ciliary portions of the iris show fibrosis and atrophy, and there is no particularly normal tissue remaining. The root of the iris on either side is the site of a very severe inflammation which has caused formation of a membrane with a total posterior synechia. The inflammation is still very marked.

Ciliary body. There is very severe inflammation in the ciliary body which has resulted in partial destruction, with necrosis of the stroma. The epithelial layers are degenerating and proliferating.

Choroid. There is a very extensive hemorrhage of the superior oidea of the ciliary body and choroid on one side which has filled the space with a clot. The choroid shows a diffuse and fairly intense inflammation.

Retina. The retina is almost completely necrotic as a result of the hemorrhage. It is detached and the structure in the anterior part of the eye is supported by cyclitic membrane.

Optic nerve. The optic nerve shows complete atrophy.

Vitreous. The vitreous is filled with hemorrhage and shows extensive inflammation.

Lens. The lens is dislocated forward into the cornea and is cataractous.

DIAGNOSES

1. Uveitis, Behçet's disease.
2. Absolute glaucoma due to inflammation.
3. Cataract due to uveitis.
4. Hemorrhage, subretinal, with necrosis of the retina.

CASE 2

CLINICAL DIAGNOSIS

Iridocyclitis, Behçet's disease.

HISTORY

The history was not received.

GROSS EXAMINATION

A left eye measuring 24 by 22 by 23 mm. The left lateral rectus partially remains. The eye is firm. The cornea is shrunken and small measuring 9 by 8 mm. There is a large brown area at the 9-o'clock position on the sclera. There is no proof of a perforating wound on the sclera. There is a small amount of hemorrhage at the 12-o'clock position on the cornea. The eye does not transilluminate well. The cornea is hazy, horizontal clots. The retina is in place. The vitreous is jellylike. There is considerable anterior choroid hemorrhage in the anterior half of the vitreous cavity. There is a dense retrolental membrane. The lens is in place. There is a dense white material in the anterior chamber.

MICROSCOPIC EXAMINATION

Circumcorneal tissue. The conjunctiva shows a very intense inflammation with dilatation of the vessels and a massive infiltration of acute and chronic inflammatory cells.

Cornea. The corneal epithelium is entirely missing due to previous edema. The stroma shows a slight diffuse keratitis with thinning and atrophy of the fibers and separation of the lamellae by edema fluid. Bowman's membrane is replaced by a pannus peripherally. The endothelium is partially missing.

Limbus. Schlemm's canal is dilated and contains blood. The trabecular fibers are dilated and separated by edema fluid and round cells. The deep scleral vessels are engorged.

Sclera. There is an episcleritis and a tenonitis throughout almost the entire globe but this infiltration is patchy in type.

Anterior chamber. Contains a serohemorrhagic fluid containing scattered polymorphonuclear leukocytes.

Iris. There is a very intense iritis with formation of a fibrovascular membrane on the surface and infiltration of the vessel layers and posterior surface with masses of round cells. The iris adheres to the lens over a broad zone of dense fibrous connective tissue and there is occlusion of the pupil by a membrane.

Ciliary body. There is a massive inflammation of the entire ciliary body including the stroma, muscularis, and epithelial layers. The inflammation has extended through the layers into the circumlental space and extends across the eye to form a cyclitic membrane to which the detached retina is adherent. The muscularis and stroma of the ciliary body are separated by a massive edema exudate and the vessels are engorged. Polymorphonuclear leukocytes and chronic inflammatory cells fill this fluid. The epithelial layers are detached by the fluid. A beginning cyclitic membrane extending across the eye is observed. Study of the section shows no specific organisms in the polys or in any of the phagocytes which are present.

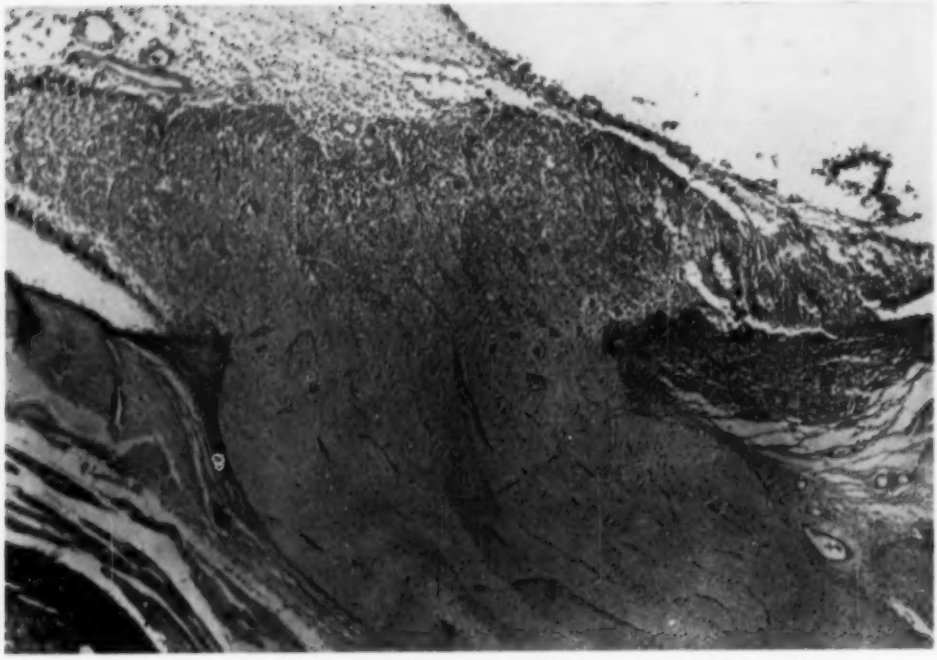
Choroid. The choroid shows a similar massive inflammation, particularly in the anterior portion. Posteriorly the choroid is thickened, with diffuse infiltration of lymphocytes which affects all vessel layers and extends somewhat into the ora serrata. The pigment epithelium is also affected. There is nothing specific about the character of the infiltrate in the choroid, however.

Retina. There is a total detachment to the central strand. The detached retina is folded, disorganized, markedly inflamed, and shows extensive degeneration so that the usual pattern of layers is hardly recognizable. Polymorphonuclear leukocytes also infiltrate this structure at many points.

Optic nerve. The optic nerve shows a papillitis with extension of polymorphonuclear leukocytes and round cells into the disc and slightly beyond the lamina cribrosa.

Vitreous. The vitreous was liquefied and shows secondary fibrosis from the cyclitis membrane.

Lens. There is a cataract and the lens shows a folding and thickening of the capsule with degeneration of the cortical fibers. The epithelium is proliferated on the posterior surface.



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2. Absolute glaucoma due to inflammation.
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Clinical diagnosis

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History

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3. Choroiditis, Behçet's.
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HEMATOLOGY OF PATIENTS

Hematologic examinations of the patients together with complete information and details will be published later. However, records of three patients are given as samples:

CASE 2

Erythrocytes: 3,770,000 mm.³
Leukocytes: 7,400 mm.³
Hemoglobin: 80 percent.
Segment: 66 percent.
Eosinophil: 1 percent.
Lymphocytes: 15 percent.
Monocytes: 16 percent.
Basophils: 2 percent.

CASE 13

Erythrocytes: 3,040,000 mm.³
Hemoglobin: 62 percent.
Leukocytes: 12,200 mm.³
Segment: 73 percent.
Eosinophils: 1 percent.
Lymphocytes: 15 percent.
Monocytes: 11 percent.
Toxic granulation: +

CASE 14

Erythrocytes: 3,670,000 mm.³
Hemoglobin: 65 percent.
Leukocytes: 9,600 mm.³
Segment: 68 percent.
Eosinophils: 3 percent.
Lymphocytes: 15 percent.
Monocytes: 13 percent.
Basophils: 1 percent.
Toxic granulations: +

It is interesting to note that, in these three patients, there are unusually numerous lymphocytes which contain azurophil granulation and neutrophils which contain toxic granulation. There is also a shift to the right. The tables showing the blood formulas indicate the presence of reticulo-histocytic action, which shows that the virus causing the disease is mesenchymetrophic.

DISCUSSION

The studies and observations of the 20 new cases show that, besides the three cardinal symptoms (iridocyclitis, aphthae in the mouth, and genital ulcerations) an affection of the joints resembling acute polyarticular rheumatism and recurring frequently is also present in all of the patients. In the past history of most, a long and febrile illness has occurred which was of doubtful origin and which resembled typhoid or malaria.

Behçet's disease can be diagnosed in patients by laboratory examinations before the eye manifestations start. However, it has not yet been possible to diagnose the disease by laboratory examinations in patients who have only recurrent iridocyclitis with hypopyon and in whom the other signs have not yet become manifest. In the new series of cases, the appearance of the disease during a short period in three brothers living in the same house is of enlightening value for the epidemiology of the disease. This fact indicates that the disease is communicable.

Viremia is always present in the patients. It increases during every attack and gradually disappears in one to two months. The immunity antibodies of the disease show a negatively correlated cycle with viremia, in such a way that, as the antibodies get fewer, the degree of viremia increases in the blood and, when the antibodies reach the highest level, viremia decreases in blood. The clinical signs of the disease and the new crises also appear in association with viremia.

The patients regularly excrete in their urine the virus which has entered into the circulatory system; this excretion appears to be correlated to the degree of viremia.

The use of cortisone during treatment (Cases 3 and 4) caused the increase of clinical manifestations and the decrease of the complement-fixation reaction. This result was of value in bringing about an experimental disease, as well as in producing typical iridocyclitis with hypopyon in the eyes of rabbits by applying systemic cortisone before and after inoculation.

CONCLUSION

The preliminary investigations which were presented at the French Ophthalmo-

logical Congress, as well as my latest studies, prove that Behçet's disease is an independent entity caused by a virus which is present, particularly during the crises, in the blood and urine of the patients. Our attempts to isolate the virus from the fluid of the anterior chamber and from the lesions in the mouth and on the skin gave negative results. However, the virus can be isolated from the fluid of the subretinal exudate. The antibodies appear in the blood of the patients after a certain period of time which is not yet known. When antibodies are not present, hemocultures can be of value for diagnostic purposes. The complement-fixation reaction which is as high as 1/126 during periods of remission, decreases to 1/64 and even to 1/16 during an acute crisis.

The virus is liberated in the urine, at least during viremia.

Summary

1. All patients with Behçet's disease had had an illness of the joints similar to polyarticular rheumatism.

2. The disease can be diagnosed and the virus can be isolated from the blood of patients who have aphthae in their mouth and on their genital organs but in whom the eye manifestations have not yet appeared.

3. Observation of the disease in three brothers indicates that it is communicable.

4. Viremia is present in the patients and its degree may be correlated with the clinical manifestations of the disease.

5. As the degree of viremia increases in the blood, the titrate of the complement-fixation reaction decreases; on the contrary, as the degree of viremia decreases, the titrate of the complement-fixation reaction increases.

6. The virus is excreted in urine and is thus eliminated from the circulatory system.

7. Cortisone treatment is contraindicated, since it increases the clinical manifestations and decreases the titrate of antibodies in the blood.

Cerrahpasa Hospital.

Acknowledgements

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A CASE OF BEHÇET'S DISEASE

Bernard H. Zeavin, M.D., Merrill J. King, M.D., and Robert S. Gohd, Ph.D.
Boston, Massachusetts

Introduction

Behçet, a dermatologist at Istanbul, first delineated his "triple symptom complex" in 1937, describing six cases which showed recurrent attacks of aphthous ulcers in the mouth and on the genitalia along with ocular lesions of the conjunctiva and cornea. Some of his cases had iritis without hypopyon, but this was not considered an integral part of his syndrome. Subsequently, the syndrome has been expanded to include various skin lesions, of which the commonest is supposed to be erythema nodosum, and other ocular

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I should like to thank Dr. Michael J. Hogan of the University of California for his kind help in the histopathologic examinations of the cases, Prof. G. Rake of Philadelphia for making the examinations with the electron microscope and for taking the photographs. I also appreciate the valuable advise and suggestions of Dr. Phillips Thygeson of the University of California and the kind cooperation of Miss Mildred Weisenfeld of the National Council to Combat Blindness, Inc.

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A CASE OF BEHÇET'S DISEASE

Bernard H. Zeavin, M.D., Merrill J. King, M.D., and Robert S. Gohd, Ph.D.
Boston, Massachusetts

Introduction

Behçet, a dermatologist at Istanbul, first delineated his "triple symptom complex" in 1937, describing six cases which showed recurrent attacks of aphthous ulcers in the mouth and on the genitalia along with ocular lesions of the conjunctiva and cornea. Some of his cases had iritis without hypopyon, but this was not considered an integral part of his syndrome. Subsequently, the syndrome has been expanded to include various skin lesions, of which the commonest is supposed to be erythema nodosum, and other ocular

lesions, including hemorrhagic retinitis, vitreous hemorrhage, and recurrent attacks of hypopyon iritis. The hypopyon iritis is now considered essential to the diagnosis of the condition. Previous descriptions of various manifestations of the disease were made by Reis in 1906, and later by Adamantiadis, Dascalopoulos, and Whitwell.

The geographic distribution of the disease is extremely interesting in that most of the cases have occurred in Egypt and the Near East. The literature contains only two reports of the illness occurring in persons born in the United States, one female and one male. Because of the rarity of this disease in the United States, we are reporting an additional case.

Report of a case

This 54-year-old white man was seen by M. J. K. on March 18, 1954, when he was found to have old keratic precipitates and posterior synechias in the right eye, together with ulcers in the mouth and one on the penis. At that time he had no hypopyon, and had been unable to work for three months because of poor vision. He was admitted to the Massachusetts Eye and Ear Infirmary for the first time on March 27, 1954, for investigation of his condition. The patient, a machinist, was born in Boston and had never left the United States except for three months in 1919, when he travelled to Canada, England, and Denmark.

History

The patient's general health had been good except for a low-grade productive cough due to bronchiectasis in the left lower lobe, first demonstrated in 1949 by an outside physician.

Genital sores were the first manifestation of his present illness, appearing in August, 1952, as several painful scrotal ulcers which cleared spontaneously in three weeks. In December, 1952, several similar scrotal ulcers appeared, and by using an ointment prescribed by his local physician these cleared in a few days. Since that time, these scrotal ulcers had recurred about every month, but always healed in a few days by the application of the above ointment. His present scrotal ulcer had appeared about 10 days previous to admission. His only penile ulcer had appeared on the shaft about one month previous to admission and was now completely healed, although a scar had been left.

Skin manifestations began in November, 1952, with the sudden appearance of several small round, red, tender, subcutaneous nodules in his left leg below the knee. A local physician diagnosed thrombophlebitis, and advised elevation of the feet. These cleared in a few days. Since then, he had had recurrences on either or both legs below the knees about every four to six weeks, and always lasting the usual three or four days. His last episode had been six weeks previously, until four days ago when he had developed a red, tender nodule on the left calf which disappeared in three days. The day before admission he had developed another one on the left calf.

Ocular symptoms began in February, 1953, with a sudden painless complete loss of vision in the right eye, diagnosed by a local eye doctor as a massive hemorrhage (? vitreous). His vision in this eye never cleared since this hemorrhage. At the same time he was told that he had iritis in the right eye and was given local atropine and cortisone. About one week later, the left eye developed iritis and he began the same treatment in both eyes. For the past year since his first attacks of iritis, he had recurrences in either or both eyes, each attack lasting a little less than a week, so that he had never really been free of some ocular inflammation.

Buccal sores were the next manifestation of the disease, first appearing in November, 1953, since when he had always had at least one or more sores in his mouth at various sites, for example, tongue, inside of the lower lip, inside of the cheek, one prolonged painful ulcer on the soft palate, one on the

left tonsil, and so forth. These ulcers usually ran a course of at least several weeks, a new crop erupting before the others healed, so that ulcers were always present in his mouth. At first it was thought that these ulcers were related to the ingestion of the various antibiotics he was receiving, but for five weeks previous to admission he had received no antibiotics, and yet the ulcers had persisted. Indeed, two new ulcers appeared on the inside of the upper lip only the day before admission.

Possibly related to the above group of symptoms was a spontaneous swelling of his right knee about one and a half years ago. This was tapped by a local physician, and about one and a half cups of watery fluid were drained. There was no recurrence. Probably not related to the above syndrome was an aching in both knees and in the right hip beginning in 1942, when the patient was working in a shipyard. He stated that these ships had come from all over the world. Aching in the above joints had continued to the present in a mild form, but there had never been any joint stiffness noted.

General physical examination

In the right buccal mucous membrane, a jagged deep ulceration about one cm. in size presented with a surrounding zone of erythema (fig. 1). In the mucous membrane of the mouth underneath the upper lip were two beginning ulcers. On the right side of the scrotum, there was a two-cm. ulcerating lesion, deep and purulent, discharging greenish-yellow exudate (fig. 2). The shaft of the penis had an oval ulcer approximately two cm. by one cm. in diameter, which was almost healed. Over the left lower leg on the posterior calf, there was a two-cm. tender area of palpable subcutaneous induration with a wide surrounding zone of erythema. There were some follicular pustules on the back of the arms. The only other physical finding was some dullness with decreased breath sounds and medium rales at the left base posteriorly in the left lung.

Fig. 1 (Zeavin, King, and Gohd). Aphthous ulcer in the right buccal mucous membrane.

Fig. 2 (Zeavin, King, and Gohd). Aphthous ulcer on the scrotum.

Ocular examination

Vision was light perception in the right eye, and 16/70 with correction in the left eye. There was no evidence of any active inflammation in both eyes, which were white and quiet. The anterior chambers were clear, as were both corneas. Scattered posterior synechias prevented full dilatation of the pupils, and gave evidence of the old attacks of iritis (fig. 3). Only a black reflex could be obtained in the right eye, and no fundus could be seen, partly due to a complicated cataract and partly due to vitreous opacity.

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Fig. 1 (Zeavin, King, and Gohd). Aphthous ulcer in the right buccal mucous membrane.

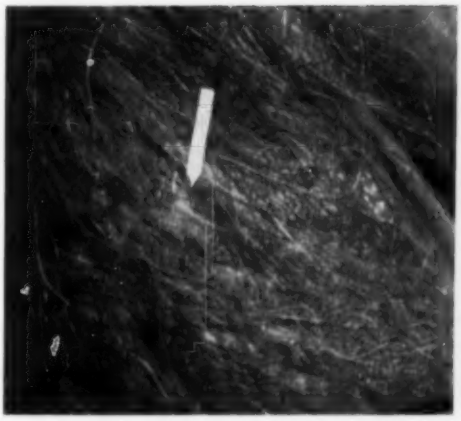

Fig. 2 (Zeavin, King, and Gohd). Aphthous ulcer on the scrotum.

Ocular examination

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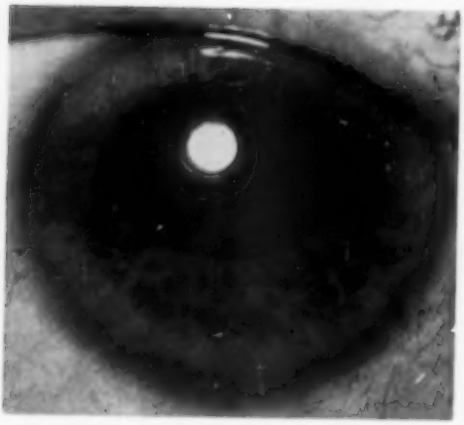

Fig. 3 (Zeavin, King, and Gohd). Right eye on April 5, 1954, showing evidence of old iritis but no active inflammation.

Many vitreous floaters in the left eye interfered with a good fundus examination. However, a hazy view revealed the disc and posterior pole to be normal. Tension of both eyes was normal.

Laboratory data

Chest X-ray films showed thickening of the base of the left lung, which could be bronchiectasis. Sinus X-ray films showed pus in both antra. Mantoux skin test, using old tuberculin 1:1,000 dilution, was negative.

Complete blood count was normal, with a hemoglobin of 13.4 gm. Corrected blood sedimentation rate was 36 mm. in one hour. Serum protein levels were within normal limits, as were nonprotein nitrogen and fasting blood sugar levels. Urinalysis was not remarkable. Terminal urine failed to culture "L" bacillus (Pleuropneumonia bacillus). Blood Hinton test was negative.

Sputum smears showed many polymorphonuclears and some gram-positive diplococci, but no tubercle bacilli were found in acid-fast smears. Sputum culture grew only alpha hemolytic streptococci and Neisseria catarrhalis. Nose culture grew coagulase-negative staphylococci, and a throat culture grew alpha and beta hemolytic streptococci. Culture of the scrotal lesion on Sabouraud's medium was negative for fungi.

A biopsy of one of the tender, red, subcutaneous nodules of the left leg was performed, but the pathologic report was inconclusive, noting only some neovascularization in the corium.

Course

During the patient's entire hospital stay, he had no ocular inflammation. Hence, upon his discharge from the hospital, he was instructed to return immediately if such should occur. He returned six weeks later, on May 17, 1954, with a fresh attack of hypopyon iritis in the right eye (fig. 4). In the interval between the two hospital admissions, the patient had noted three new scrotal ulcers, three round red tender areas on the legs below the knees at two-week intervals, and a half dozen aphthous ulcers in the mucous membrane of the mouth, for example, under the tip of the tongue, inside the right and left cheeks, and one on the inside of the lower lip (fig. 5).

At this time, a paracentesis of the right eye was performed, while the hypopyon was still present, and some was inoculated on a rabbit's cornea, while the rest was used in the virus studies described below. Secretion from a fresh ulcer on the tongue was also

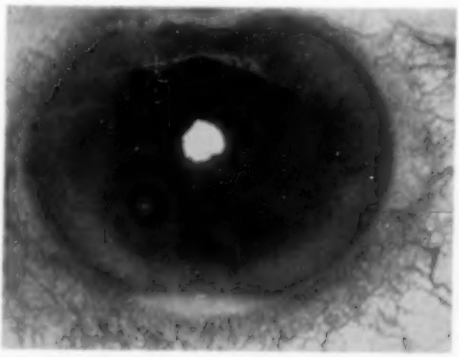

Fig. 4 (Zeavin, King, and Gohd). Right eye on May 17, 1954, showing a fresh acute hypopyon iritis.

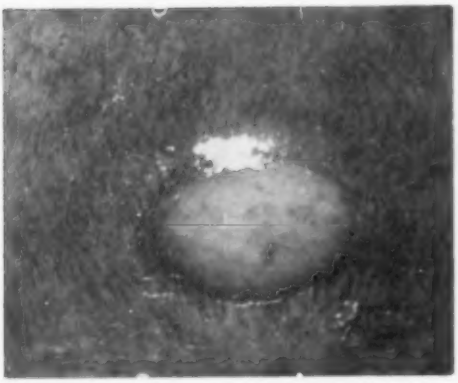

Fig. 5 (Zeavin, King, and Gohd). Aphthous ulcer on inside of lower lip.

inoculated on a rabbit's cornea. Both rabbits' corneas were negative for the virus of Herpes simplex.

Attempts at isolation of a viral agent

Early attempts at isolation of viral agents from cases of Behçet's disease generally met with failure. Material such as aqueous humor from the anterior chamber of the eye, washings or scrapings of lesions of the mouth, scrotum, and penis apparently were found to be innocuous for experimental animals. Recently, a viral agent that produced lesions in rabbits, mice, guinea pigs, and embryonated eggs was isolated by Sezer. In his paper, it was stated clearly that successful propagation of the agent occurred only when the vitreous or subretinal fluids of the eye were employed for isolation procedures. In our case, it was not possible to obtain either vitreous or subretinal fluids. However, aqueous was removed from the eye with the hypopyon and was available for manipulation in the laboratory. Experiments with this material were completely negative, and in this respect the negative findings of Sezer and the earlier workers were confirmed.

The following is a summary of the procedures that were employed for the detection of a viral agent:

Mice were inoculated by the intracerebral route. None developed signs of impairment of neural function during 16 days of observation.

Aqueous humor was inoculated into the allantoic sac of embryonated eggs. On the third day after inoculation, all the eggs were viable and no gross pathology could be detected either in the chick membranes or in the organs of the embryo. Allantoic fluid was harvested from these embryos and an aliquot was inoculated into mice by the intracerebral route. No impairment of neural function was detected in these mice during a two-week period of observation.

Aqueous humor was inoculated onto the dropped chorioallantoic membrane of fertile eggs according to the method of Buddingh. No lesions were observed 72 hours later. The membranes were cut from the eggs, minced, and inoculated onto a second series of dropped membranes. In a similar manner, a third passage was made. No lesions were observed on the membranes of either the second or third passage.

Sezer, employing the dropped membrane technique, produced lesions readily when vitreous or subretinal fluid from Behçet's disease were used for inoculation. The aqueous humor apparently was devoid of the agent that produced such lesions.

Comment

The recurrent attacks of aphthous ulcers of the mucous membrane of the mouth, scrotum, and penis, and the almost pathognomonic hypopyon iritis fit very well into the classical descriptions of Behçet's disease. The recurrent, red, tender, subcutaneous indurations on the legs were diagnosed clinically by a dermatologist as erythema nodosum, another commonly described manifestation of the disease. Another lesion mentioned by other authors is vitreous hemmorhage, one of which marked the onset of this man's ocular complaints. Arthritis consultants felt that this man's joint symptoms were probably due to osteoarthritis. They also thought that the

joint effusion described by this man as having occurred in his right knee, was probably traumatic, although this has been described as an occasional manifestation of the disease.

Dr. Igersheimer, who worked with Behçet on his original cases, saw the patient in consultation and he believed that this man conformed to the entity, Behçet's disease. He also advised against any heroic measures directed at this man's sinuses or lungs, since in the past all treatments had proved futile in preventing the progression of the eye lesions.

The etiology of Behçet's disease is still unknown. Many theories have been advanced in the past, and subsequently discarded. At the present time, a virus etiology has gained the widest acceptance. Behçet, when first describing the syndrome, suggested that it was caused by a virus, and demonstrated inclusion bodies in smears made from the contents of the aphthous ulcers and the hypopyon. However, this has never been substantiated by any other workers. In 1953, Sezer reported the isolation of a filtrable virus from the subretinal fluid. We attempted growth of a virus from the hypopyon, but, like Sezer, our results were sterile. In our case, we were not permitted to extract vitreous for culture for a filtrable virus, and hence we could not confirm Sezer's other experiments.

Summary

1. A case of Behçet's disease is described exhibiting:

a. Recurrent attacks of aphthous ulcers on the scrotum and penis.
b. Recurrent aphthous ulcerations of the mucous membrane of the mouth and tongue.
c. One observed attack of acute hypopyon iritis, with a history and evidence of countless recurrent attacks of iritis in both eyes.
d. Recurrent attacks of erythema nodosum on both legs.
e. A history of joint effusion in the right knee.
f. One massive vitreous hemmorhage.

2. Attempts at isolation of a virus from the hopopyon fluid are described.

3. The rarity of the disease in people born in the United States is noted.

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FURTHER CONSIDERATIONS ON THE SURGICAL CORRECTION OF BLEPHAROPHIMOSIS (EPICANTHUS)*

EDMUND B. SPAETH, M.D.
Philadelphia, Pennsylvania

This condition includes a group of congenital defects due to developmental faults: (a) in the orbits within the periaxial mesodermal masses which normally would differentiate into the ocular muscles; and (b) in those various structures which form the canthal angles. The word "blepharophimosis" is the oldest of the terms used to identify the condition; the term dates from von Ammon in 1841,[1] and it does seem preferable for some reasons to the more recent term "epicanthus" because it includes this with all the possible complicated types.

Ptosis of the upper lid is an almost constant and significant part of this anatomic complex. The ptosis, usually, is not paralytic but due to an aplasia of the levator muscle and to the subsequent fibrosis of this muscle and its tendon.†

The historic phase of blepharophimosis is rather interesting. That [illegible]ct to which I shall refer, in a moment, [illegible]een well covered in *Die Krankheiten [illegible]ugenlider* by L. Schreiber.[2] Accordin[illegible] v. Ammon,[1] "blepharophimosis is a [illegible]ormation, of faulty development, aplasti[illegible] in type, the dorsum of the nose being strikingly low and broad and the skin over it abundant." Heredity is also involved.[3] Repeatedly the condition has been seen in mother and child, in father and child, and one family has appeared with the father and all three children involved. I have had one family with the mother and two of her three children involved.

v. Ammon,[1] in 1860, distinguished the following types according to the origin of the fold:

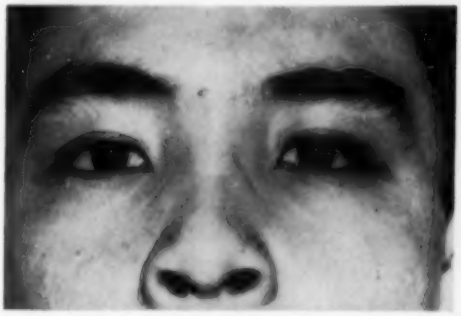


Fig. 1 (Spaeth). Epicanthus palpebralis, quite classical in type.

1. *Epicanthus supraciliaris,* which originates from the region of the eyebrows and continues medially toward the lacrimal sac or even beyond toward the bridge of the nose. This type is the rarest of them all.

2. *Epicanthus palpebralis,* the largest and widest variety of epicanthus, which originates from the skin of the upper lid *above* the tarsal fold between the latter and the concave side of the eyebrow (figs. 1 and 2). This site of origin gives an unusual width to the epicanthus and a strong sickle-shaped curvature which frequently extends to the lower margin of the orbit. Figure 3 shows a similar case, also with an external canthal-angle deformity and, as with Case 2,

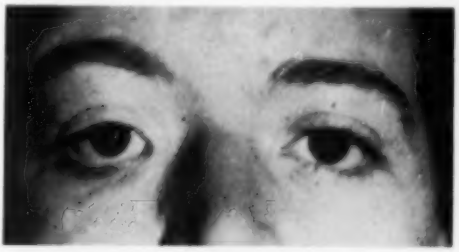


Fig. 2 (Spaeth). Epicanthus palpebralis with an external canthal angle defect.

* From the Graduate Hospital, The Graduate School of Medicine, University of Pennsylvania. Presented before the Section of Ophthalmology, the New York Academy of Medicine, May, 1955.

† Congenital ptosis without a canthal defect, in a very large percentage of cases, is due to a partial III N. nuclear aplasia rather than to any type of peripheral orbital pathology.

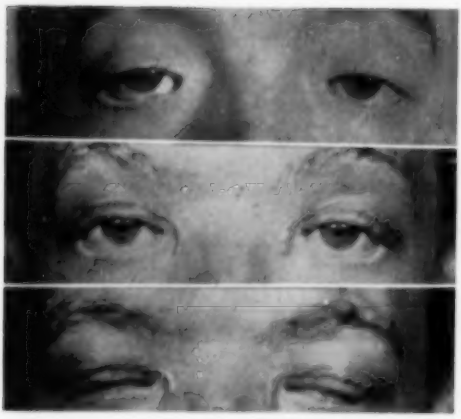


Fig. 3 (Spaeth). Epicanthus palpebralis, dissimilar in degree, with a right external canthal angle defect. Surgery done, epicanthus resection with levator resection (not presently described technique) was complicated by keloid formation.

with dissimilar degrees of epicanthus, this being more marked on the right. Dissimilarity in degree, bilaterally, is common in this type.

3. *Epicanthus tarsalis,* which originates always *from* the tarsal fold of the upper lid and continues to the lower margin of the orbital cavity or it may end just beneath the inner canthus in the skin of the lower lid; or it may fade away, without surrounding the inner canthus, into the skin close to the inner corner of the lids (fig. 4).

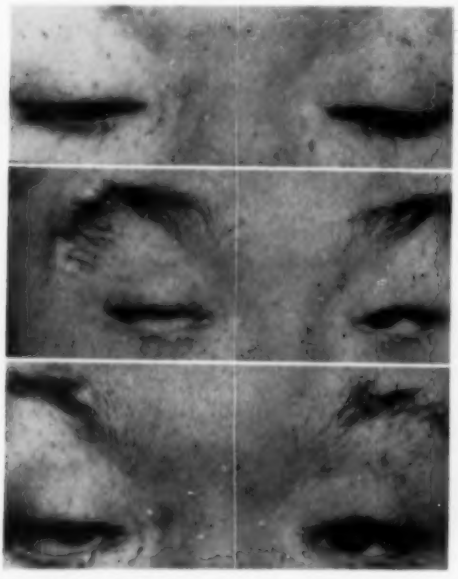


Fig. 4 (Spaeth). Epicanthus tarsalis, with a very evident tarsal deformity.

4. *Epicanthus inversus,* which is a less frequent form of this anomaly. This was first described by Braun[4] on the basis of 14 cases from the University Eye Clinic in Prague. The peculiarity of this variety is that it originates from the lower lid instead of the upper lid, it encircles the medial end of the uninvolved lid, and the inner angle of the lids is not necessarily covered by this fold. The canthus is not located in its normal position; instead, it is moved laterally so that its distance from the dorsum of the nose is increased.

Figure 5 is the original photograph of one of Braun's cases. It illustrates typical epicanthus inversus with congenital ptosis.

Additional notes, as to anatomic condi-

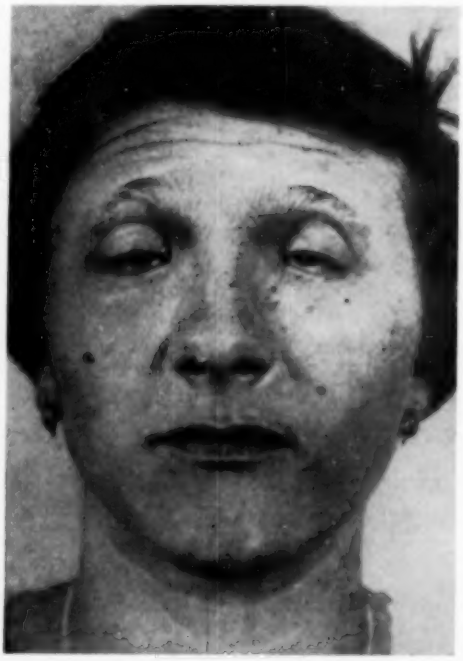


Fig. 5 (Spaeth). Original photograph of one of Braun's cases. This illustrates typical epicanthus inversus, congenital ptosis, and a dissimilar length of the lid margins.

tions, not included in Braun's early description are: a dissimilarity in the length of the two lid margins and a shortening of the palpebral fissure, which in addition may take a somewhat oblique course. Associated with these changes one finds regularly a great degree of congenital ptosis caused by aplasia of the levator palpebrae superioris, as well as a shortening of the upper lid in its vertical extent. This latter may be a result, however, rather than a basic situation. This form of epicanthus was also mentioned by Axenfeld and Brons[5] and by Komoto.[6] Axenfeld and Brons emphasized particularly the difficulty of its operative correction.

The careful examination and surgical exploration of three of the four types discloses the following basic pathologic changes. The ptosis, which is frequently quite extensive, is not only paralytic but also fibrotic. The upper lid itself is stiff and inelastic, and the tarsal plates are shell-shaped with an anterior convex and posterior vertical concave curl, as well as with an abnormal horizontal curvation. The superior cul-de-sac is shortened, and the levator muscle and tendon are thick, and inelastic, and perhaps also fibrosed. The vertical measurements of the lids are frequently shortened. The upper and lower lid margins are dissimilar in linear length, sometimes grossly so. The characteristic epicanthal fold arises either from the edge of the eyebrow at the inner angle of the upper lid, from the upper lid, from the medial canthal angle bridging the angle, or lies almost wholly within the lower lid and arising from it.

Other deformities are not uncommonly present—entropion, trichiasis, and epiblepharon are the most common of these complications. In addition, it seems that most of these children also have a delay in the development of the bridge of the nose. Sometimes this deformity is so marked that one feels that surgery might be delayed a bit until this structure has developed somewhat. In earlier years, I felt very strongly about this. In recent years it has seemed to be somewhat less significant to a satisfactory correction, except for cases of simple epicanthus without the other lid deformities. Mental deficiency appears in these cases in a percentage higher than in the average, though this is not an attribute of the basic condition.

In discussing the surgery, it is quite interesting to quote (in translation) portions of the section on "Blepharophimosis" as it appears in that work on surgery which I, with many others, feel has been the greatest of all surgical texts. The book is *Augenärtzliche Operationslehre* published in *Handbuch der Gesamten Augenheilkunde*,[7] by Th. Axenfeld and A. Elschnig (1922), the two giants in ophthalmic surgery, than whom there have been none greater.

The skin folds of epicanthus, whether they run perpendicularly or obliquely, can usually be smoothed out by lifting the skin of the dorsum of the nose. The time-honored operation of v. Ammon (rhinorrhaphy), see Figure 6A, involves the excision of an elliptical piece of skin at the height of the dorsum of the nose. Since the epicanthus frequently disappears during the later years of growth, the operation should not be performed before puberty.

If primary healing occurs, the effect is very favorable. If suppuration of the wound occurs, the incision site will open up and a more or less disfiguring scar will be added to the existing epicanthus. Kuhnt,[8] in his operation similar to that of v. Ammon's, did not remove the deeper layers of skin and limited the excision to the superficial layers. The skin edges of the side flaps freed from periosteum are joined over the oval skin excision with silver wire (which is not necessary—author) and a deep skin suture.

The procedure of Arlt is hardly ever used. In this the skin folds, overlying the corners of the lids, are excised. Verwey[9] reports two cases of severe epicanthus, ptosis, and narrowing of the palpebral fissure. By means of two Y-shaped incisions placed horizontally and joined by their apices (see Figure 6B) the operator was able to achieve an increase in the horizontal tension and a decrease in the vertical tension, and thus a satisfactory cosmetic result.

The rare congenital formation of a skin fold, especially on the lower lid, usually associated with entropion and merging with epicanthus, can be removed by the excision of an oval skin fold near the edge of the lower lid (Bachstez,[10] 1916). The same author reported failures with cantholplasty, while he was successful with the method of Graefe, consisting of the excision of a triangular piece of skin with its broad base on the skin fold.

The requirements are both a cosmetic and a functional correction—the elevation of the ptotic lid, a lengthening of the palpebral fis-

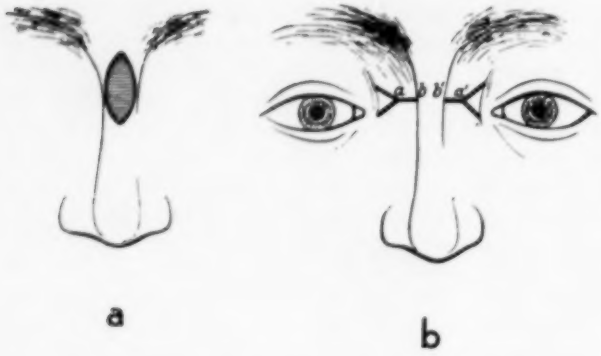


Fig. 6 (Spaeth). (A) Epicanthus resection of v. Ammon. (B) Verwey's technique. The apex of triangles a and a' are to be moved medialward toward b and b', and there to be sutured into position.

sure, an equalization in the lengths of the upper and lower lids, and, last, a satisfactory disposal of the epicanthal folds.

The surgery of blepharophimosis, historically and for any one of the types, has had two aspects. The first of these, and a most unsatisfactory phase, was based upon tissue resections. v. Ammon in 1841, and again in 1860, first discussed this. Blaskovicz moved the site of the resection from the nose to the lateral canthus in 1922, using a curved concave-convex incision, and I, in 1926,[11] changed this to a medial straight and lateral concave incision and skin resection for the correction. All of these were bad because, while cosmetically they did improve appearance, functionally they did damage.

Apparently, the first person who realized that tissue resection was not the cure of blepharophimosis was Verwey, in 1909. There is no doubt that he was the first to appreciate the necessity for the rearrangement of tissues rather than the resection of the defects. His technique was most interesting (fig. 6-b). The two Y incisions lying upon their side with the diverging arms into the angle permitted the operator to spread the single arm and then, with sutures, to carry the triangle between the two diverging arms, which contains the epicanthal fold, nasalward. In this manner he eliminated a certain amount of the fold and adjusted, to some extent, the dissimilar lengths of the lid margins. The technique, though inadequate, was a very important step toward the consideration of adequate surgery.

Blair, in 1930, presented before the Philadelphia College of Physicians, the next intelligent approach to the correction of this condition (fig. 7). In this he used two triangular flaps from the epicanthus turned inward upon themselves in an attempt to eliminate the epicanthal fold and to equalize the lid margins. At the same time he used a C-shaped or J-shaped incision into the lower lid, at the external canthal angle, to assist in the equalization of the length of the lid margins. I used this technique several

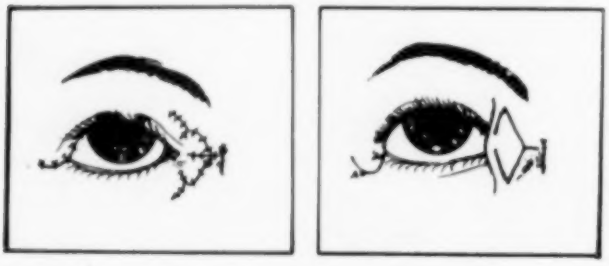


Fig. 7 (Spaeth). Blair's original illustration for his technique.

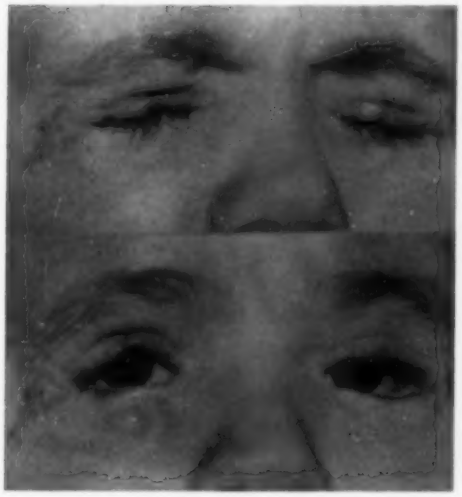


Fig. 8 (Spaeth). See text.

times and found it unsatisfactory. Figure 8 shows such a case after such surgery. (The original surgery was done by Blair.)

In 1934, I[12] presented my technique for epicanthus surgery. This technique was inspired by that first presented by Blair (fig. 9). It utilized the anterior portion of the epicanthal fold as two triangular flaps, these to be moved, respectively, the upper of the two into the upper lid, and the lower of the two into the lower lid. As a result, the tension of the lids should be removed and the fold smoothed out, without a tight cicatrix remaining to cause eversion of the puncti. The steps in the operation, abstracted, are as follows: (a) crucial incision of the epicanthal fold; (b) incisions into the upper and the lower lids at a right-angle; (c) undermining of all the flaps and incision edges, including the orbicularis fibers; (d) a closure of the orbicularis fibers with fine catgut, as necessary;* and (e) a closure of the skin flaps and incisions in their newly transplanted position.

The differences between Blair's operation and mine are evident. My operation elongates the palpebral fissure. (The sizes of the two flaps can be adjusted to a greater or lesser extent depending upon the size of the lid fold, as in Blair's procedure.) Principally, however, it carries additional tissue into the upper and the lower lids to correct the deficiency of soft tissue present there, this additional skin originating in the epicanthal fold. The operation moves the inner canthus toward a normal position so that the caruncle can be seen.

This technique is most satisfactory for cases of epicanthus palpebralis and epicanthus tarsalis, that is, situations in which the fold is fairly evenly divided between the two lids, though as said, the two flaps can be cut of a dissimilar size.

Stallard's Z-plasty utilizes the best features of both of these procedures and is to be recommended[13] (fig. 10) in cases of palpebral epicanthus, as illustrated in Figures 1 and 2.

Many of the cases of blepharophimosis are cases of epicanthus inversus, a type of defect in which the greatest epicanthal fold arises from the lower lid, passing upward; hence an entirely different technique is advisable for these. This technique has now

* Closure of the orbicularis fibers is seldom necessary, for at this place the fibers are normally compressed into rather inconsequential arcs functioning almost as a source or origin of muscle action.

Fig. 9 (Spaeth). My technique for epicanthus correction. (Ophthalmic Operations by S. Philps: Baltimore, The Williams and Wilkins Company, 1950.)

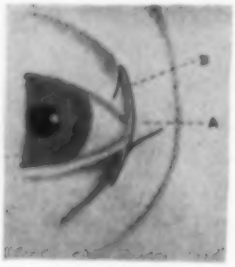
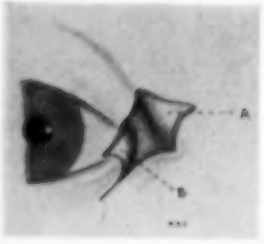


Fig. 10 (Spaeth). Stallard's technique.



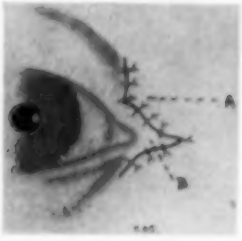


Fig. 11 (Spaeth). All the surgery is done at the medial canthal angle and in the lower lid. See text for details.

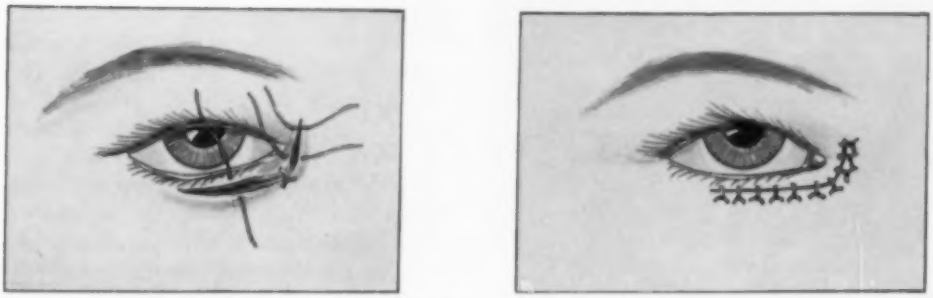


Fig. 12 (Spaeth). Operative technique. See text for details.

been done in many instances and seems to be fairly satisfactory. The basic principle is to eliminate the epicanthal fold and to equalize the length of the two lid margins. All the surgery is done at the medial canthal angle and in the lower lid (see figs. 11 and 12).

The first incision is along the lower lid margin, about two mm. below the lash line, and it passes through the skin and the orbicularis fibers. It is to be carried upward into the epicanthal fold for a certain definite distance, depending upon the size of the fold, and then downward again, upon itself, in a looping incision line. All tissues inferior to this incision are well undermined. The apex of the triangle formed by the inverted "V" of the incision is resected (as shown in fig. 11, the heavily shaded portion).

After undermining below, this incision line is closed with sutures moving the superior lip toward the nose and the inferior lip lateralward. In this way the palpebral fissure is elongated, the lower lid margin is lengthened, and the epicanthal fold itself, in part by the apex resection, is eliminated.

As the skin forming the fold is moved into the lower lid one must be careful not to exaggerate the correction and thus cause an obliquity of the palpebral fissure. In closing, the first suture is the most important because it controls the degree of correction. This is placed at the angle, for the closed incision line will be a right-angle—a capital "L," lying upon its side. When the portion, lateral to this angle, is closed, the remaining sutures must be placed very carefully to prevent puckering of the lower lip of the wound.

It is best to place the next suture in the exact middle, measuring from the end of the incision to the angle, and tie that suture. Then the two sections of the incision still to be closed are similarly treated with a suture in the midpoint of each area for closure.

The four areas now outlined are similarly treated. This will permit a satisfactory rearrangement of the skin edges. In certain cases with extreme differences in the length of the upper and lower lid margins it may be advisable to adjust the orbicularis fibers at the medial canthal angle before any skin sutures are placed. (See especially the lower left lid in fig. 13.) When that seems necessary, the orbicularis fibers are lightly approximated with 6-0 chromic catgut sutures as they now lie in their relaxed undermined position.

The ptosis may or may not be corrected at the same operation. The epicanthus, though, should be corrected first. The condition of the levator and of the superior rectus muscles controls the technique used in the correction of the ptosis. If the levator muscles are

Fig. 13 (Spaeth). Epicanthus inversus.

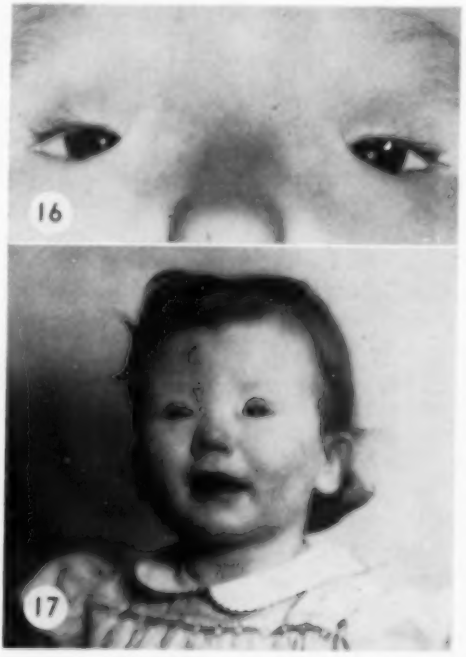
Fig. 14 (Spaeth). Epicanthus inversus.

completely inert, it is rather unwise to attempt a correction by a levator resection. If the superior rectus muscles are normal bilaterally, and one can operate the case early in life (that is, before the fourth year), and the tarsal plates are not too fibrotic, then one may utilize, with good surgical results, a Motais procedure. The Eversbusch procedure, which is an exterior route levator resection, should be very satisfactory in somewhat older children. Suspension of the lid, as with the Friedenwald nonabsorbable permanent suture or with a fascia lata sling, is to be used only in the extreme cases. Skin and muscle suspension procedures as the Hunt-Tansley, the Hess, the Gifford, and the Reese techniques are usually not very satisfactory because of the lid fibrosis and the tarsal plate deformity already present.

Those cases sufficiently fortunate to have good-to-fair levator function should obtain good cosmetic results through surgery regardless of the degrees of deformity. Deformities such as tarsal place contractures, shallow superior cul-de-sacs, and/or differences in the degree of the ptosis can be adjusted by this ptosis surgery so that the end results are equal in the two eyes.

In these cases, while operating, it is quite necessary to inflate the superior cul-de-sacs with a subconjunctival injection of procaine and adrenalin when starting the levator section, even though general anesthesia is being used. If this is done it is possible to uncover readily the superior edge of the tarsal plate with the initial conjunctival incision. As one continues with a classical Blaskovicz's technique it becomes very evident that fibrosis of the levator tendon is a characteristic of this condition. It is important to remove carefully all levator tendon fibers as well as nonstriped muscle fibers from the superior conjunctival cul-de-sac. This is shallow even before the surgery and unless that careful

Fig. 15 (Spaeth). Epicanthus inversus immediately following the removal of sutures, showing the elimination of the epicanthal fold and the equalization of the palpebral fissures. See the elevation of the eyebrows in an attempt to elevate the lids—ptosis compelled.



Figs. 16 and 17 (Spaeth). (16) The child at the age of one year. (17) Four weeks following surgery at the age of two years.

dissection is carried out it will continue so, in fact the cul-de-sac may prolapse postoperatively.

The usual working rule for a levator resection operation is to resect two mm. of levator tendon for each mm. of ptosis. This amount of resection is not possible, nor even necessary, in the average case of blepharophimosis. It is seldom necessary and hardly possible to resect more than a total of five mm. of levator tendon.

One must be careful when doing the partial tarsectomy not to remove orbicularis fibers with this tarsectomy. Even some skin of the lid has been inadvertently resected at times. If the skin should be buttonholed, the hole can be closed with 5-0 catgut through the conjunctival incision.

The second row of lid sutures for the formation of the lid fold must be placed very carefully. The conjunctival insertion for these should be higher in the superior fornix and their skin exit at a slightly lower level than would be used for uncomplicated ptosis. In this way the abnormally shallow superior fornix will be deepened, and a good lid fold formed as well. Instead of the usual three of such doubled-armed sutures it is better to use five so that they can be placed closer together and thus give, postoperatively, firmer cul-de-sac-levator-orbicularis and skin adhesions.

Figs. 18 and 19 (Spaeth). (18) One year prior to surgery. (19) Four weeks after surgery at the age of two years.

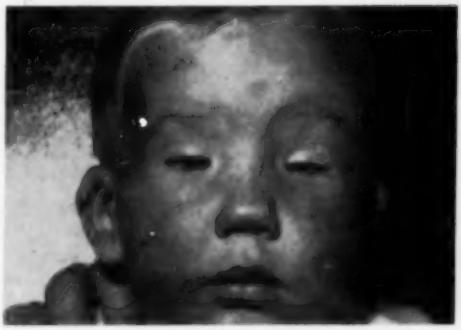


Fig. 20 (Spaeth). Epicanthus inversus prior to surgery.

Figures 13 and 14 are two cases of epicanthus inversus dissimilar in degree, one eye compared to the other, as well as dissimilar in amounts of ptosis, and could only be corrected by a technique such as just described. Figure 15 is a case of epicanthus inversus prior to the ptosis correction, immediately after the removal of the sutures (which is done on the fourth or the fifth day).

Figures 16 and 17 are photographs of a

Fig. 21 (Spaeth). Suture line, prior to the removal of the sutures. (Case shown in Figure 20.)

Fig. 14 (Spaeth). Epicanthus inversus.

completely inert, it is rather unwise to attempt a correction by a levator resection. If the superior rectus muscles are normal bilaterally, and one can operate the case early in life (that is, before the fourth year), and the tarsal plates are not too fibrotic, then one may utilize, with good surgical results, a Motais procedure. The Eversbusch procedure, which is an exterior route levator resection, should be very satisfactory in somewhat older children. Suspension of the lid, as with the Friedenwald nonabsorbable permanent suture or with a fascia lata sling, is to be used only in the extreme cases. Skin and muscle suspension procedures as the Hunt-Tansley, the Hess, the Gifford, and the Reese techniques are usually not very satisfactory because of the lid fibrosis and the tarsal plate deformity already present.

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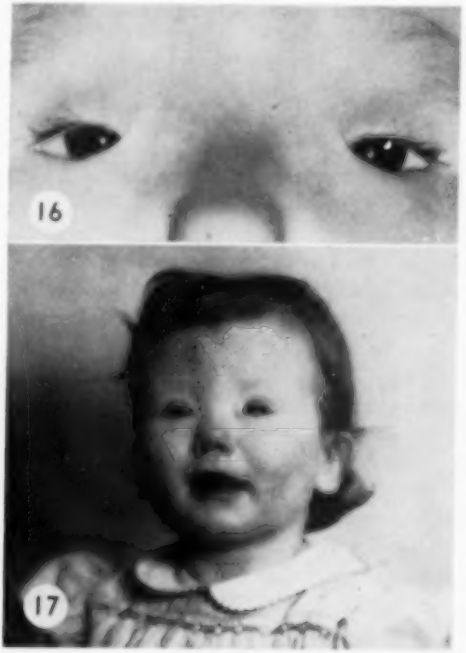
Fig. 15 (Spaeth). Epicanthus inversus immediately following the removal of sutures, showing the elimination of the epicanthal fold and the equalization of the palpebral fissures. See the elevation of the eyebrows in an attempt to elevate the lids—ptosis compelled.



Figs. 16 and 17 (Spaeth). (16) The child at the age of one year. (17) Four weeks following surgery at the age of two years.

dissection is carried out it will continue so, in fact the cul-de-sac may prolapse postoperatively.

The usual working rule for a levator resection operation is to resect two mm. of levator tendon for each mm. of ptosis. This amount of resection is not possible, nor even necessary, in the average case of blepharophimosis. It is seldom necessary and hardly possible to resect more than a total of five mm. of levator tendon.

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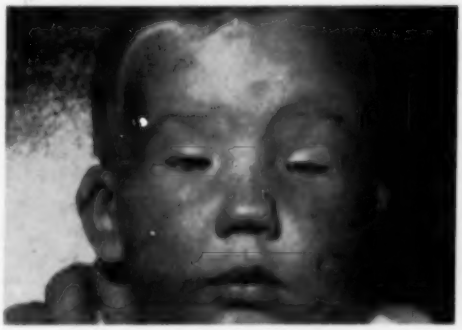

Fig. 20 (Spaeth). Epicanthus inversus prior to surgery.

Figs. 18 and 19 (Spaeth). (18) One year prior to surgery. (19) Four weeks after surgery at the age of two years.

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Figures 16 and 17 are photographs of a

Fig. 21 (Spaeth). Suture line, prior to the removal of the sutures. (Case shown in Figure 20.)

Fig. 22 (Spaeth). Same case as in Figures 20 and 21, 18 months later.

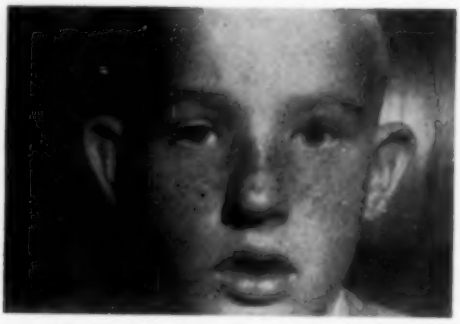

Fig. 23 (Spaeth). Same case as in Figures 20, 21, and 22 one additional year later.

child—Figure 16 at the age of one year and Figure 17 at two years of age and four weeks following the surgery. Figures 18 and 19 are illustrations of a child, one year prior to the surgery and four weeks after the surgery, the child then being two years old.

Figures 20 through 23 are a series of a case of epicanthus inversus with ptosis. Figure 21 is the suture line prior to the removal of the sutures; Figure 22 is the patient 18 months later; and Figure 23 is the same child still one year later. The difference in appearance between Figures 20 and 23 is very evident.

Conclusion

To recapitulate, the following points are to be stressed:

a. Blepharophimosis has a historical aspect which is quite interesting.

b. The surgery as it has been carried out in the past has gone through two rather interesting phases. An attempt has been made to trace this. Tissue resections cannot correct the basic pathology. They may eliminate the epicanthal fold, but when that is done the palpebral fissure is elongated only by dragging the inner canthal angle toward the midline, thereby increasing the ptosis and failing to correct the dissimilarity in the palpebral fissures. The plastic rearrangement of tissues as they lie in the epicanthal folds is the proper method for correction.

c. The ptosis, which is related to the symptom complex, needs special attention, but this is not tremendously difficult, nor is it involved.

d. The condition is an ophthalmologic one, should be corrected by an ophthalmologist, and should consider four aspects: (1) The correction of the ptosis, (2) the elongation of the palpebral fissure, (3) a correction or adjustment of the dissimilarity in the length of the lid margins, and (4) the elimination of the epicanthus. All this, apparently, can be done satisfactorily at the medial canthal angle.

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OPERATIONS FOR EPICANTHUS AND BLEPHAROPHIMOSIS*

An evaluation and a method for shortening the medial canthal ligament

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Duke-Elder[1] classifies epicanthus as:

1. Arising from the region of the eyebrows and running toward the tear sac or the nostrils (epicanthus supraciliaris).

2. Arising from the upper lid, above the tarsal region and extending to the lower margin of the orbit (epicanthus palpebralis).

3. Arising from the tarsal fold and losing itself in the skin close to the inner canthus (epicanthus tarsalis).

He also recognizes a fourth type, epicanthus inversus. This type of epicanthus is, in my experience, always associated with ptosis and a certain degree of blepharophimosis, and has a strong hereditary tendency.

The skin fold in this condition arises in the *lower* lid and runs *upward* and there is more or less lateral displacement of the inner canthi, producing an abnormally long distance between the inner canthi of the two eyes. The margin of the upper lid frequently has a slight S-shaped curve and the lower lid, in many cases, has an abnormal concavity downward. This concavity is greatest in the lateral half of the lid (fig. 1). In addition, the puncta are frequently displaced laterally even more than would be expected from the lateral displacement of the inner canthi. Usually the lateral displacement of the canthi is due to abnormally long medial canthal ligaments but in some instances the medial orbital walls are abnormally separated from each other, but without true hypertelorism. Such cases are more difficult to correct surgically (fig. 3).

The first three types of epicanthus are usually not associated with ptosis or blepharophimosis and tend to regress markedly with growth of the face and particularly with development of the bridge of the nose.

In general, operations on these types are not warranted until the child is in the teens. By this time, most cases have become less obvious and need no operation. The remainder can be operated upon by one of the standard procedures, the best of which is probably the Blair operation[2] (v. infra).

Epicanthus inversus, on the other hand, is usually a more disfiguring condition and, in addition, the accompanying ptosis frequently must be operated upon at an early age because the lids are often so low as to interfere with vision in one or both eyes. These children usually have to walk with heads thrown back in order to see under the ptotic lids.

The ptosis cannot be corrected properly without first freeing up the tissues at the

* From the Massachusetts Eye and Ear Infirmary.

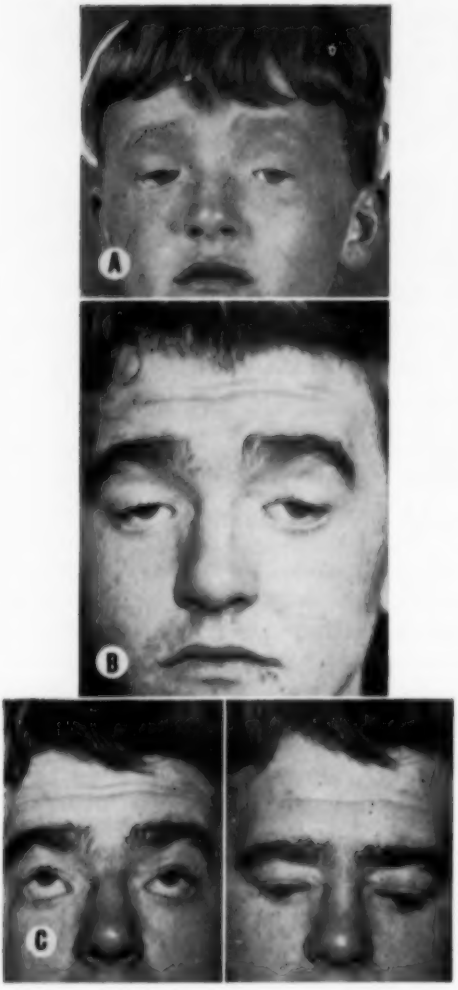

Fig. 1 (Johnson). A) This patient illustrates all the conditions which may be found with epicanthus inversus, including the slight S-shaped curve of the upper lid margin and the abnormal concavity downward of the lower lids.

(B) This shows the result of a von Ammon canthoplasty, Blair epicanthus operation, and my medial canthus shortening procedure. This picture was taken six years after A.

(C) The final result, after Friedenwald-Guyton frontalis sling suture.[5] Note the abnormal downward curvature of the lower lids. Possibly this could have been improved had the Blaskovicz type of lateral canthoplasty been done rather than the von Ammon.

medial and lateral canthi and lengthening the fissure. The ptosis is partly mechanical, due to the accompanying blepharophimosis. In addition, there is seldom any demonstrable levator function, many have an accompanying weakness of the superior recti, and in an appreciable number there is true paresis of upward gaze. In spite of this, most have a good Bell's phenomenon. The demonstration of an active Bell's phenomenon (rolling up of the eyes on closure of the lids) is, of course, an extremely helpful sign. If it is not present, one must be careful not to achieve too high a postoperative position of the lids or corneal exposure and ulceration will ensue, the corneas being unprotected by the upper lids in sleep.[3]

Very little has been written concerning the choice of operation in epicanthus inversus, so it seems worthwhile to report here the results of operations in 20 eyes (10 patients) done in the past few years at the Massachusetts Eye and Ear Infirmary. Only those cases in which there has been adequate follow-up have been used for this study. Twelve eyes were operated upon by me and in the rest I was assistant to and instructor of Massachusetts Eye and Ear Infirmary ophthalmic residents and followed each of the cases pre- and postoperatively.

It would seem reasonable in the presence of a long medial canthal ligament to attempt to shorten that ligament, but I know of only one report which concerns such a procedure.[4] Hughes shortens the ligament by means of a catgut stay suture which he passes from medial canthus to the periosteum of the side of the nose and out through the skin to be tied over a rubber peg.

I have had very poor results when I have used absorbable sutures to perform a similar procedure which I shall describe below. In my opinion there is too much tension on the medial canthal ligament for it to heal properly in its shortened state before catgut is absorbed. In my hands silk has been a satisfactory suture material, but the best

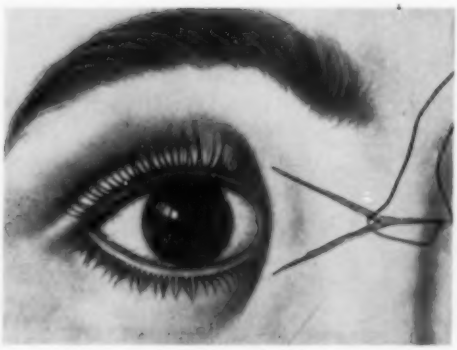

Fig. 2 (Johnson). The Y-V operation of Verwey from *Ocular Surgery* by H. Arruga, reproduced by courtesy of the author and Salvat Editores, S. A., Barcelona.

which I have used is 5-0 braided steel* on half-curved cutting needles.† This material is very strong, flexible, and can be tied in a knot like ordinary silk sutures. It excites very little reaction in the tissues and I have never had one slough out.

In my early cases I combined a tucking of the medial canthal ligament with a vertical elliptical excision of skin medial to the inner canthus as described by Blaskovicz and modified by Spaeth.[5] A von Ammon canthoplasty was performed at the lateral canthus. Six eyes were operated upon in this way with fair results. The fault with a simple excision of an ellipse of skin is that there is a tendency for a partial recurrence as time goes on and the skin stretches. It is based on a false premise, that is that there is an excess of skin in the horizontal meridian, whereas what we actually have is a deficiency of skin in the vertical meridian. A rational operation should, therefore, lengthen the skin vertically in the region of the medial canthus.

A somewhat more rational procedure is the Y-V incision of Verwey (fig. 2). Wendell Hughes[4] has improved upon this operation and does an extensive undermining of tissues surrounding the medial canthus.

Six eyes were operated upon using Verwey's skin incision combined with a shortening of the medial canthal ligament and an external canthoplasty (fig. 3). This is a more satisfactory procedure than simple excision of an ellipse of skin, but still tends to lose some of its effect as the skin stretches.

The procedure which has given me the best long-term results in six eyes is the Blair operation[2] for the epicanthal fold combined with a tucking of the medial canthal ligament and an external canthoplasty.

The anatomy of the palpebral ligaments as described by Wolff (fig. 4) is rather simple. The medial palpebral ligament is triangular, lies on the frontal process of the superior maxilla from the anterior lacrimal crest to a point near its suture with the nasal bone. The lower border is free and the upper border is continuous with the periosteum.

* Davis & Geck's "Surgaloy," product no. 70.

† Lane's cleft palate needle, half circle, regular eye, trochar point, Berbecker figure 155, size no. 1.

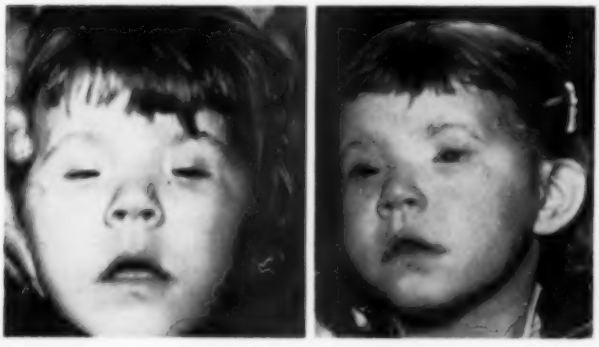

Fig. 3 (Johnson). Pre- and postoperative pictures, showing the result of my method of shortening the medial canthal ligament combined with a Y-V skin incision and a von Ammon canthoplasty. The result of the operation for epicanthus is satisfactory but was limited by the fact that part of the lateral displacement of the medial canthi was due to abnormal separation of the medial orbital walls. The result of the subsequent ptosis operation (Reese[7]) is only fair.

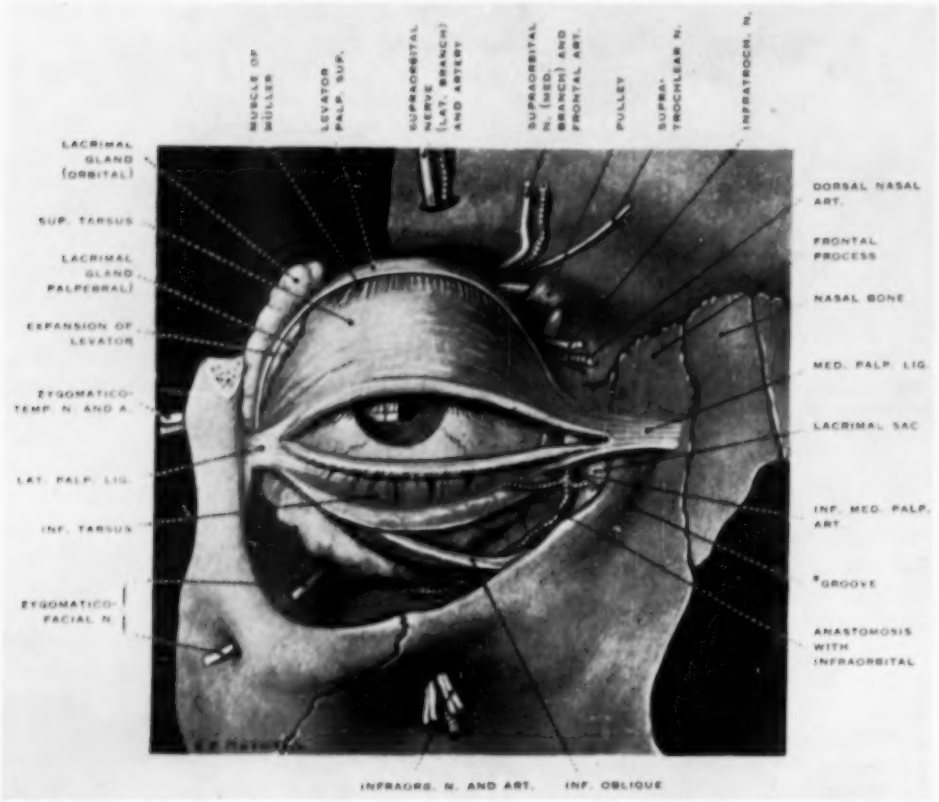

Fig. 4 (Johnson). The anatomy of the palpebral ligaments reproduced from *Anatomy of the Eye and Orbit* by Eugene Wolff, 3rd edition, London, H. K. Lewis and Company, Ltd.

In the region of the anterior lacrimal crest it divides into anterior and posterior portions.

The posterior portion is continuous with the lacrimal fascia and helps roof the upper part of the lacrimal sac.

The anterior portion is continued at the inner canthus into two bands which pass across the lacrimal fossa but are not in contact with the sac. They attach to the medial ends of the lacrimal plates. Wolff has been unable to demonstrate any deep portion behind the lacrimal sac.

The lateral palpebral ligament, according to Wolff, is attached to the orbital tubercle on the zygomatic bone 11 mm. below the fronto-zygomatic suture. It is 7.0 mm. long, 2.5 mm. wide, and lies deeper than the medial ligament, so it is not prominent under the skin. Its upper border unites with an expansion of the levator and its lower border with expansions from the inferior oblique and inferior rectus.

The operation which I now favor is done as follows:

The external canthoplasty is done first in order to allow sufficient relaxation of tissues at the medial canthus. Several variations are possible here. The simple von Ammon canthoplasty (fig. 5) is the one most frequently used. A single cut is made with strong scissors exactly at the apex of the external canthus. This should be inclined slightly downward to conform to the curve of the upper lid. The conjunctiva is undermined

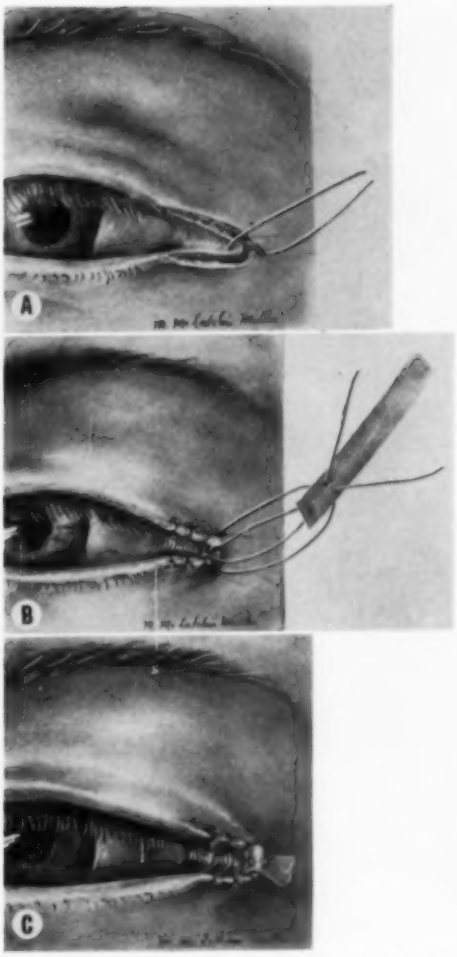

Fig. 5 (Johnson). My modification of the von Ammon canthoplasty. A horizontal cut parallel to the fibers of the lateral canthal ligament is made as described in the text.

(A) Shows the first suture used to approximate the undermined conjunctiva to the skin.

(B) Shows the completed suturing of the skin and the sutures in place in the rubber tissue which is used to help form a new fornix and also to keep the newly lengthened fissure open.

(C) Shows the completed canthoplasty with rubber tissue in place.

and sutured to the skin margins. The new fornix can be deepened laterally and the tendency for the canthotomy to close can be obviated by suturing a piece of thin rubber tissue tightly against the new angle of the external canthus by means of a double-armed suture.

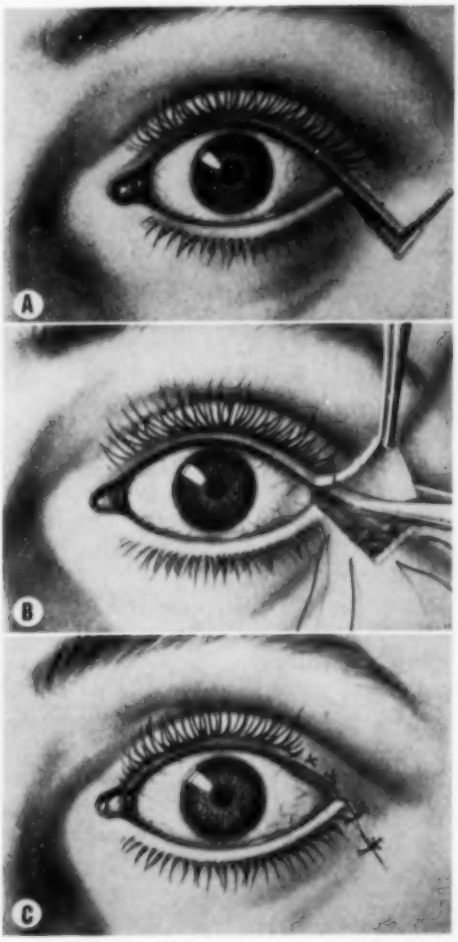

Fig. 6 (Johnson). The Blaskovicz canthoplasty from *Ocular Surgery* by H. Arruga, reproduced by courtesy of the author and Salvat Editores, S. A., Barcelona.

(A) Shows the incision through skin, subcutaneous tissues, and part of the canthal ligament.

(B) and (C) Illustrate excision of excess skin and closure of incision.

The von Ammon canthoplasty is frequently modified by making a vertical cut through the upper and the lower arms of the horizontally divided external canthal ligament. This may, in some instances, be a

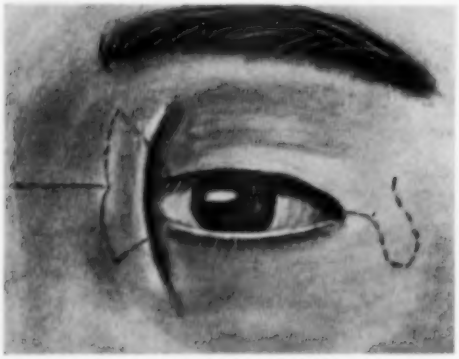

Fig. 7 (Johnson).* The skin incisions for the Blair operation. (See text.)

disastrous procedure because it reduces the support of tissues at the lateral canthus. When the subsequent ptosis operation is performed there is a marked tendency for the outer portion of the upper lid to evert. This happened in two of my cases and because of it I was unable to obtain a sufficient correction of the ptosis.

Blaskovicz's canthoplasty (fig. 6) lengthens the upper lid without lengthening the lower and is of value in cases in which there is an abnormal downward curvature of the lower lid (fig. 1). Lengthening the lower lid in such cases tends to accentuate the downward curvature.

A modification of the Blaskovicz canthoplasty is usually decribed as part of the Blair epicanthus operation (figs. 7, 9, 10, and 11). The incision is started at the lateral canthus, goes temporally for 3.0 or 4.0 mm. through the canthal ligament, curves down and temporally for 5.0 or 6.0 mm., then curves upward, ending 7.0 to 8.0 mm. temporal to and 4.0 to 5.0 mm. above the external canthus. The flap and the skin on its temporal side is undermined, while that continuous with the lower lid is not. In closing, the first suture, which determines the new external canthus, is placed in the flap about 5.0 to 7.0 mm. from the former external canthus and then into the lower skin edge about 4.0 to 5.0 mm. from the previous external canthus. The remainder of the sutures are placed as shown in the diagrams. This type of canthoplasty is not essential to the success of the Blair epicanthus operation; as a matter of fact, I prefer the von Ammon in most cases.

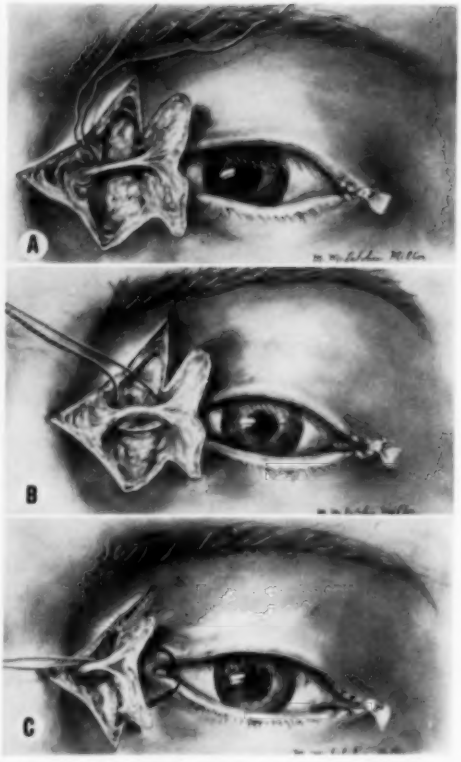

Fig. 8 (Johnson). After the skin flaps have been dissected up as described in the text and the incision for the external canthoplasty has been made as in the standard Blair procedure, or after the von Ammon canthoplasty has been completed as shown in Figure 5, a tuck is taken in the medial canthal ligament.

(A) Shows the first bite with the needle threaded with braided stainless steel wire (see text). This bite is taken in the periosteum and insertion of the ligament as far back as possible.

(B) Shows the suture after a second bite has been taken in the ligament close to the inner canthus.

(C) Shows how the ligament shortens as the suture is tied.

* Figures 7, 9, 10, and 11 are reprinted from Wiener, M., and Alvis, B. Y.: *Surgery of the Eye*, Philadelphia, W. B. Saunders Company, 1940.

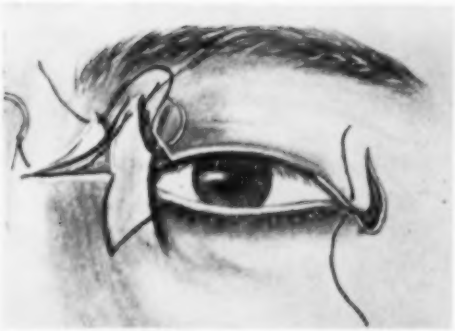

Fig. 9 (Johnson). The Blair operation. Transposition of the upper skin flaps and closure of the external canthoplasty. In most cases, I prefer the modified von Ammon canthoplasty as shown in Figures 5 and 8.

Fig. 10 (Johnson). The Blair operation. Completion of the suturing.

The procedure on the medial canthus is as follows (figs. 7 to 11):

The horizontal incision is made first, starting about 5.0 mm. medial to the inner canthus and running medially for about 8.0 mm. Next, two curved incisions are made as shown (fig. 7), starting at the lateral end of the horizontal cut and extending upward and downward for 7.0 or 8.0 mm. A straight cut is then made from the end of each of these incisions to the margins of upper and lower lids 4.0 mm. from the inner canthus. It can be seen that we actually have two Z incisions, one above and one below the mid-horizontal line. The two upper and the two lower flaps are next dissected up in preparation for transposition. By blunt dissection it is now quite simple to free the tissues anterior to the medial canthal ligament, following the ligament back and medially to its insertion on the superior maxilla (figs. 4 and 8). The braided steel suture (v. supra) is then passed into the ligament as close to the canthus as possible, another bite is taken in the insertion of the ligament in the periosteum. The suture is then tied, shortening the ligament to approximately one half its previous length and bringing the inner canthus about 3.0 mm. closer to the medial orbital wall and slightly posterior to its previous position. The skin flaps are then transposed and sutured as in the standard Blair procedure (figs. 9, 10, and 11).

A pressure dressing is then applied with special care to achieve maximum pressure over the region medial to the inner canthus. The dressing is removed in three days and re-applied. The dressing and the skin sutures are removed in six to seven days.

Figure 12-A, B, C, shows a case in which the Blair procedure was done in combination with a tucking of the medial canthal ligament. A comparison of A and B illustrates the marked improvement which can be achieved in the appearance of the medial canthi and C shows the final result after surgery for convergent strabismus and a Reese operation for the ptosis.

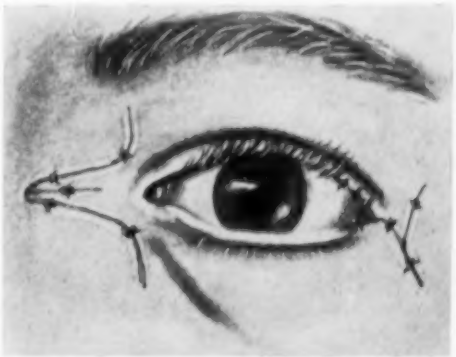

Fig. 11 (Johnson). The final appearance of the standard Blair procedure. See Figures 5 and 8 for the final appearance of my usual external canthoplasty.

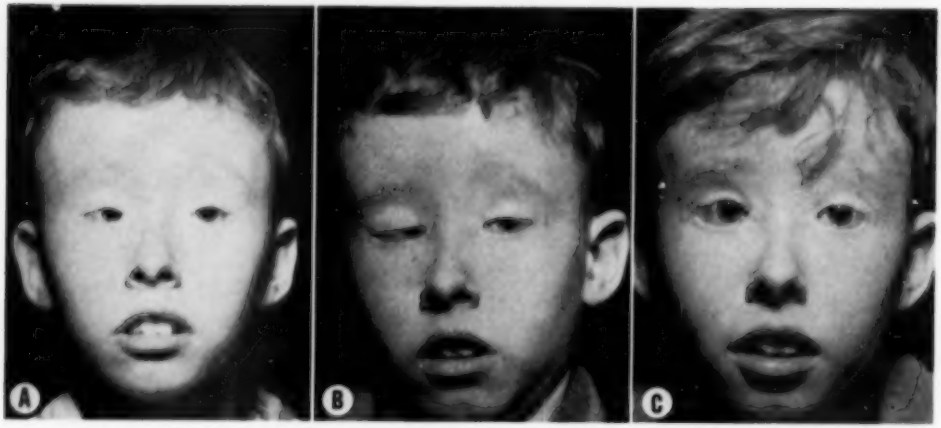

Fig. 12 (Johnson). (A). Epicanthus inversus, slight blepharophimosis, and ptosis without levator function. (B). This picture was taken a few weeks after a Blair operation and my tucking procedure on the medial canthal ligament. (C). The final result after correction of the convergent strabismus and a bilateral Reese ptosis operation. This picture was taken three months after (A).

Discussion

In patients with the syndrome of epicanthus inversus, blepharophimosis, and ptosis, one must not expect any procedure to result in an absolutely perfect correction of the deformity. On the other hand, in evaluating the results, it must be kept in mind that growth of the bridge of the nose improves their appearance markedly.

Better results will be obtained if we wait until these children are 10 or 12 years of age, but frequently they must be operated upon as young as two years because the ptosis is so severe. Most of the cases reported here were operated upon between three and five years of age.

In all cases both eyes were operated upon for epicanthus at the first operation, and a bilateral ptosis operation was done as a second procedure. If any levator action is present, I prefer to do a levator resection.[3] If no levator function can be demonstrated, the Reese[7] operation, using orbicularis fibers to form an attachment to the frontalis, is to be preferred.

In doing any plastic procedure in the region of the inner canthus, considerable scarring will result unless one is very careful to handle the skin flaps gently and to obtain perfect approximation of skin edges. There must be no dead space underlying the skin and pressure must be applied for five to seven days. If these rules are followed, any immediate scarring will fade within a year.

Summary and Conclusions

A short review of operations for epicanthus and blepharophimosis is given, together with my experiences with the various types of procedures.

A new method for shortening the medial canthal ligament by tucking with a braided stainless steel suture is presented.

In my hands, the method of correction which has given the most satisfactory results is the Blair operation on the epicanthal fold combined with tucking of the medial canthal ligament and a simple von Ammon canthoplasty on the external canthus. This is done without completely cutting through the upper and lower arms of the divided external canthal ligament.

5 Bay State Road (15).

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A SIMPLIFIED TECHNIQUE FOR CORNEAL TRANSPLANTATION*

Employing a contact-lens splint: An experimental study

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Cincinnati, Ohio

Since many surgeons are doing corneal transplantations, it was felt that, if the technique could be further simplified, some of the difficulties associated with the use of corneal sutures to hold the transplant in place could be eliminated. In the past, either direct radial sutures or overlay sutures have been used. These sutures are difficult to insert, frequently produce distortion of the graft in its bed, cause gaping when one suture is drawn tighter than another, or the edges may not be accurately aligned.

Insertion of direct sutures subjects the eye to considerable trauma and occasionally results in a nebulous or macular-radiating opacity at the marginal site of insertion. During the insertion of direct sutures, the recipient graft is frequently exposed to endothelial damage.

The procedure to be described eliminates this by holding the graft in place by means of a perforated plastic contact lens presutured to the cornea or sclera.

Although it was intended to offer this as an original research problem, when the work was almost completed it was discovered that similar projects had been undertaken by Walser[1] of Germany in 1949, Fritz[2] of Belgium in 1950, Strampelli[3,4] of Italy and Philps[5] of England in 1952. Each of these authors had, independent of one another, devised a contact-lens splint to support the corneal graft.

Walser's lens contained multiple perforations everywhere but in the center. Strampelli devised a lens with a rotating center, combining the techniques of appositional sutures and contact-lens splint. In this method the lens was held in position by being sutured to the four recti muscles. The method used by Philps was similar to Walser's, the one difference being that the perforations were spaced around the entire periphery.

Favorable results using this method in corneal transplantation on human eyes have been reported by these authors, as well as by Vail[6] of Chicago. To date no one has analyzed the physiopathologic repair which takes place in a transplantation of this type. We, therefore, continued our project with this aspect in mind.

Material

1. Animals

Eleven eyes of six full-grown rabbits were used for experimentation.

2. Lens

Plastic corneal contact lenses,* 8.0, 10, and

* From the Departments of Ophthalmology, University of Cincinnati, School of Medicine, and the General and Jewish Hospitals, Cincinnati, Ohio.

* Lenses were made by Robert Scott, Inc., Chicago, Illinois.

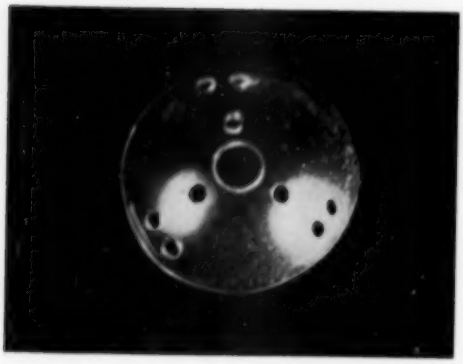

Fig. 1 (Abrahamson, Brumm, and Abrahamson). Corneal contact lens.

12 mm. in diameter were devised for this project. The lens (fig. 1) is 0.5-mm. thick with a two-mm. central perforation, three one-mm. perforations between the center and periphery, and three pairs of one-mm. peripheral holes which are used for placement of sutures.

It was hoped that by these various-sized perforations in the contact lens the cornea would be better able to maintain respiration and nutrition from the lacrimal secretions.[†]

Purpose

Our first object was to ascertain by both gross and microscopic study what damage, if any, the lens itself would produce by being sutured to the cornea for seven days.

Our next objective was to perform several corneal transplantations, using the following technique, observing the gross and microscopic changes at various time intervals following transplantation.

Technique

1. Preoperative medication

a. *Miotics.* Pilocarpine (two percent) was instilled into the eye every hour for four hours before surgery. At the time of surgery, 0.25 cc. of 5.0-percent Prostigmin was injected subconjunctivally. (Note: It was very difficult to produce miosis in rabbit eyes. Our best results were obtained with the above regime.[†])

b. *Antibiotics.* Sodium sulamyd (30 percent) was instilled into the eye every hour for four hours preoperatively. Even under the most favorable sterile conditions postoperative infection was a frequent unfavorable complication.

2. Anesthesia

The rabbits received general anesthesia

[†] Personal communication with Dr. Peter C. Kronfeld, Chicago.

Fig. 2 (Abrahamson, Brumm, and Abrahamson). Inserting the lens sutures.

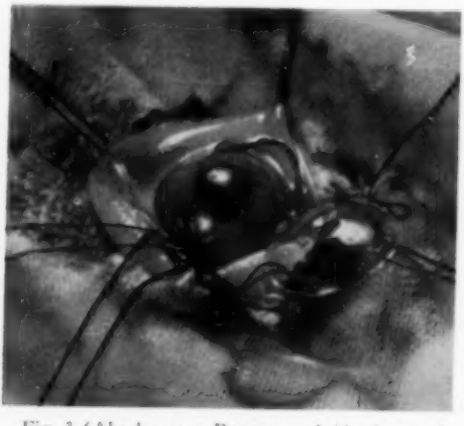

Fig. 3 (Abrahamson, Brumm, and Abrahamson). When the sutures are in place the contact lens is pulled away.

by the intravenous injection of sodium pentothal five minutes before surgery. A drop-ether cone for deeper anesthesia was used at the time of surgery. Pontocaine (0.5 percent) was instilled locally. Since rabbits exhibit a very low threshold for ether, extreme precaution had to be used.

3. SURGICAL TECHNIQUE

a. Using a regular rabbit operating table, the rabbit was anesthetized and sterilely draped after the adnexal hairs were trimmed and the skin coated with alcohol. Four 4-0 black silk sutures were inserted into the sclera in the region of the four recti muscles for fixating the globe.

b. The lens, previously sterilized in Zephiran, was then set into position on the cornea. Using 6-0 (#301 Davis & Geck) black silk, a single-armed suture was inserted through the first hole of the peripheral pair, then through the cornea and then out through the mate hole of this pair. This was repeated at each of the peripheral perforations (fig. 2).

c. The lens was then pulled aside with forceps and the suture was easily pulled out of the way (fig. 3). Using a Katzin six-mm. penetrating corneal trephine (fig. 4), a button was made in the cornea. The graft was then removed with the aid of Castroviejo corneal scissors, held away from the eye on a spatula (fig. 5), and then reapplied to the eye.

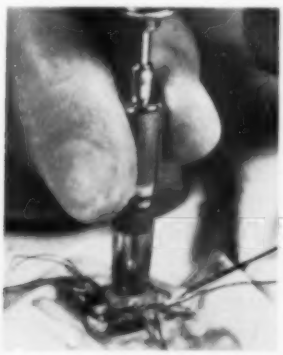

Fig. 4 (Abrahamson, Brumm, and Abrahamson). Cutting the graft with a Katzin six-mm. penetrating corneal trephine.

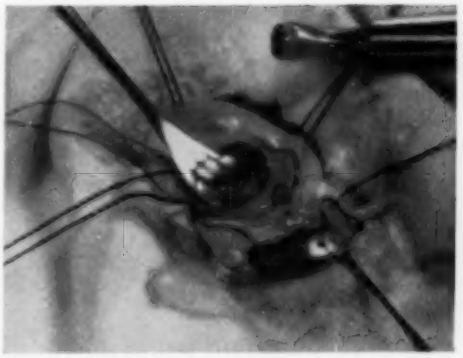

Fig. 5 (Abrahamson, Brumm, and Abrahamson). Placing the donor graft.

d. The lens was brought back into position over the graft and the sutures were tightened with equal tension on all three. After the graft appeared to be in the exact position desired, the sutures were tied with double knots. Figures 6 and 7 show several eyes with the lens sutured into position.

e. The lids were sutured together with a 4-0 black-silk suture.

Fig. 6 (Abrahamson, Brumm, and Abrahamson). The contact-lens splint is in position.

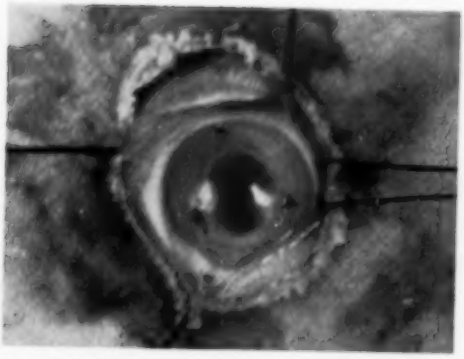

Fig. 7 (Abrahamson, Brumm, and Abrahamson). The contact lens is sutured to the cornea.

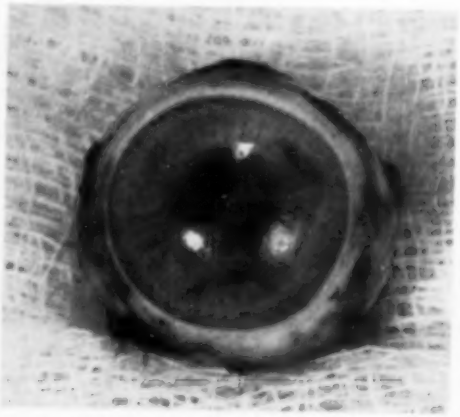

Fig. 9 (Abrahamson, Brumm, and Abrahamson). Appearance after removal of the contact-lens splint which had been in position for seven days. On Kodachrome the green stain is striking.

4. Postoperative care

The rabbits were given 300,000 units penicillin intramuscularly four times daily for five days. The lid suture was removed between the fifth and seventh days, followed by the instillation of sodium sulamyd (30 percent) drops four times daily.

5. Complications

The main complications were glaucoma and infection in the form of abscesses. The fibrinogen content of the plasmoid aqueous of the rabbits eye is so high that the angle can be easily blocked and synechias and secondary glaucoma result. This produced corneal ectasia in two cases.

If one of the lens sutures slips, the corneal graft may be pushed out of position resulting in poor approximation of the graft.

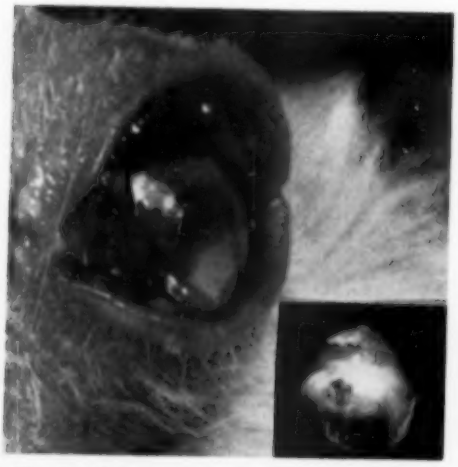

Fig. 8 (Abrahamson, Brumm, and Abrahamson). If one of the lens sutures slips, the corneal graft may be pushed out of position, resulting in poor approximation of the graft.

Fig. 10 (Abrahamson, Brumm, and Abrahamson). Microscopic section of abraded cornea.

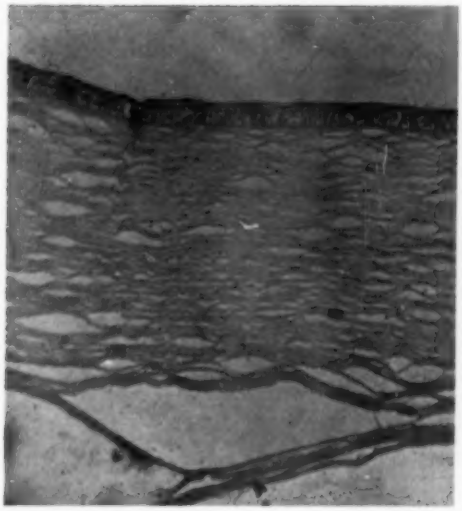

Fig. 11 (Abrahamson, Brumm, and Abrahamson). Normal cornea.

Figure 8 shows a case in which one suture slipped on the third postoperative day.

Results

1. Corneal contact lens sutured to cornea without transplant

The lens was sutured to the cornea without transplant for seven days. After the lens was removed, the cornea was stained with fluorescein and marked abrasion was quite evident (fig. 9).

Fig. 12 (Abrahamson, Brumm, and Abrahamson). Microscopic section, showing good approximation of graft to donor cornea.

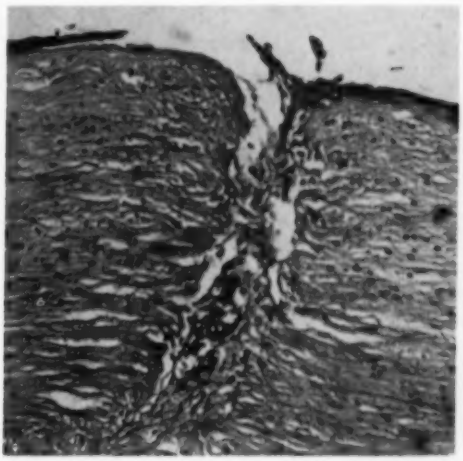

Fig. 13 (Abrahamson, Brumm, and Abrahamson). Microscopic section, showing fibroblastic proliferation and cellular infiltration.

The eye was then enucleated and the cornea was studied microscopically. Figure 10 shows the markedly abraded corneal epithelium. However, as will be pointed out later, the corneal epithelium normally will regenerate and heal nicely. Figure 11 shows a normal control cornea for comparison.

2. Following transplantations

a. A corneal transplantation was performed and the eye was enucleated after 24 hours. Figure 12 shows microscopically the excellent approximation of the donor graft to the recipient eye, as well as the normal appearing corneal epithelium.

b. Figure 13 shows the microscopic section of an eye enucleated six days after a corneal

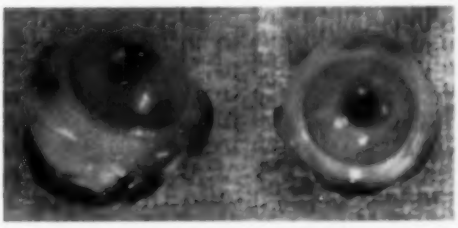

Fig. 14 (Abrahamson, Brumm, and Abrahamson). A successful corneal transplantation. No radial leukomas are present.

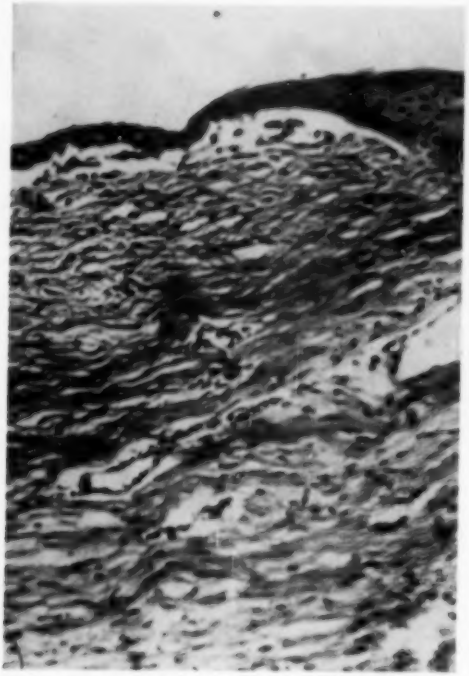

Fig. 15 (Abrahamson, Brumm, and Abrahamson). Note excellent healing in this section of a successful corneal transplantation.

transplantation using the described technique. Evidence of fibroplastic proliferation and cellular infiltration is seen and the graft appears to be taking.

c. The contact lens was removed on the seventh day from the eye in Figure 14 (a and b) which was enucleated 21 days after transplantation surgery. No radial corneal leukomas are visible. Figure 15 is a microscopic section of this eye. Note the excellent apposition and healing.

d. The contact lens was removed on the 14th day from the eye in Figure 16, which was enucleated 21 days after transplantation surgery. Note the absence of any corneal epithelial damage, and the excellent wound repair.

Discussion

The use of a corneal contact lens as a splint for corneal transplant surgery is not

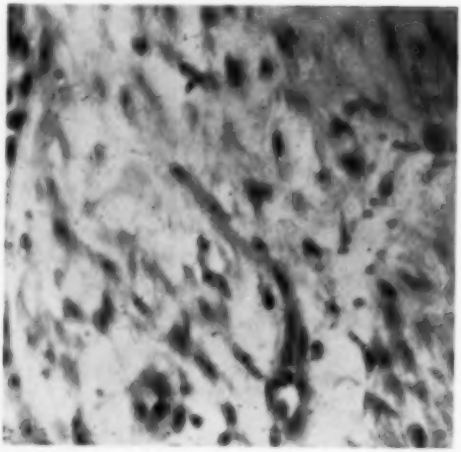

Fig. 16 (Abrahamson, Brumm, and Abrahamson). This section of a successful corneal transplantation shows absence of epithelial damage.

new. Strampelli, Fritz, Philps, and Vail have shown good results using similar contact lenses for small grafts, both penetrating and lamellar.

The advantages in using the lens herein presented are:

1. Simplicity of technique.
2. Ease and speed of application of suture.
3. Ease in removal of suture.
4. Good approximation of graft, as seen microscopically in Figures 12 and 13.
5. Good wound healing, as seen in the microscopic sections in Figures 15 and 16.
6. Absence of radiating corneal leukomas postoperatively (fig. 14).
7. Better respiration of the donor corneal graft with our lens due to the placement of the perforations both centrally and peripherally, thus enabling the lacrimal fluid to bathe the cornea more adequately.

The disadvantages are:

1. Corneal abrasion following application of the lens. This, however, clears completely after the lens has been removed.
2. If one suture of the lens slips, the donor graft may slip out of position, result-

ing in poor apposition. This complication usually does not happen with the "direct suture" method.

SUMMARY

A simple efficient technique for penetrating corneal transplantation using a corneal contact lens as a splint has been successfully used on rabbit eyes. The surgical technique is described and an evaluation of its use is presented.

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Acknowledgement is made to Phillip Wasserman, M.D., Pathology Department, Jewish Hospital, Cincinnati, Ohio, and to Derrick Vail, M.D., and Peter Kronfeld, M.D., Chicago, Illinois, for their helpful suggestions.

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ARTERIOSCLEROSIS, HYPERTENSION, AND RETINOPATHY

GENERAL AND OCULAR IMPROVEMENT WITH HORMONAL TREATMENT

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"The cause is unknown, the diagnosis is in general too late, there is no specific treatment, and the prevention is more an aspiration than a reality. Such is the actual state of our knowledge on arteriosclerosis."[1]

In a former work,[2] referring to the "reversibility" of the vascular alterations of the macula in general hypertensive and arteriosclerotic patients, the treatment and progress of a series of patients were reported. The present clinical study, begun early in 1954 and considering both general and ocular aspects, indicates encouraging improvement. Of the initial 12 patients, eight were followed for nine months—three in the Regional Institute of Ophthalmology, two referred by the Cardiology Institute, and three in private consultation. The aim was to improve both the ocular and, if possible, the general condition of the patient. The treatment carried out was based on experiments performed in the School of Veterinary Medicine, as well as on the work of Prof. Dr. Da Graña on heavyweight dogs afflicted with arteriosclerosis.

The results are shown in Table 1. As may be seen, the points considered were: sex, age, ophthalmoscopic aspect, degree of arteriosclerosis shown by the retina and choroid, vascular condition of the macula, ratio of the arteriolar-venule caliber, presence and quantity of cholesterol, and ocular history.

Before treatment was started, the diastolic and systolic arterial pressures of the patient were obtained (with the patient seated), as well as the diastolic pressure of the central artery of the retina. At termination of treat-

TABLE 1

FINDINGS IN THE EIGHT PATIENTS STUDIED

Case	1	2	3	4	5	6	7	8
Sex	♀	♀	♂	♀	♀	♀	♀	♂
Age (yr.)	66	49	66	55	64	62	70	60
Ophthalmoscopic Aspect Degree of Arteriosclerosis	III	III	III	II	III	III	II	II
Vascular condition of the Macula (grade: 1, 2 or 3)	3	3	3	High myopia	2	3	High myopia	2
a/v Caliber Ratio	1.5:3	1:3	1:3	1:3	1:3	1:3	1:3	1.5:3
Cholesterol Deposits	Some	Moderate	Meager	Meager	Heavy	Meager	Meager	Some
Ocular History	R.E. obst. central vein	L.E. paresis intern. rectus	R.E. Diminished vision	R.E. V=0.3 L.E. V=0.4	4 yr. ago Diplop. for 4 mo.	R.E. obst. Arteriolar	Intense sclerosis of the choroid vessels	
At Beginning of Hormonal Treatment General Arterial Pressure (mm. Hg) Maximum	210	220	220	260	205	250	200	220
Minimum	100	120	140	120	100	135	110	120
Retinal Diastolic Tension: Pressure (mm. Hg)	70	100	105	90	90	80	90	100
Duration of Treatment (in weeks)	11	20	14	18	14	14	8	6
End of Treatment General Arterial Pressure (mm. Hg) Maximum	150	180	185	175	150	165	155	170
Minimum	70	95	100	100	70	90	75	100
Retinal Diastolic Pressure (mm. Hg)	40	80	80	75	45	40	57	73
Time of Stabilization of the Reduced Values (in weeks)	18	8	8	8	16	4	8	8
Ocular Improvement	Yes	Yes	Yes	Yes	Yes	Yes	No	No

ment, systemic blood pressure and retinal diastolic pressure were recorded together with the time at which the reduced pressure values were stabilized as a result of treatment. Ocular improvement was verified and noted.

Of the clinical details which permit classification of a patient, the one considered most important is the diastolic pressure of the central retinal artery and for two reasons:

1. In the classification presented several years ago[4] of the three forms of arteriosclerosis of the retina, the general and retinal diastolic ratio remains normal (average 0.50) in the first degree; in the second degree the retinal diastolic pressure raises and tends to equal the general diastolic pressure; in the third degree, the retinal diastolic pressure equals, and occasionally surpasses, the general diastolic pressure. These observations have been verified by Bailliart[5] who presents typical cases, and by Cattaneo who finds that, in 90 percent of cases of essential hypertension, the normal ratio is obliterated. Bidault, Lopez, Hasebe, Hilton, Ribeiro, Dubois-Poulsen, Miller, and Vances suggest that essential hypertension may be the only alarming objective sign of advanced cardiorenal alteration.

2. The second reason for the importance of the diastolic pressure of the central retinal artery before treatment is its prognostic significance. The retinal diastolic pressure fluctuates between 70 and 105 mm. Hg; the minimum general diastolic pressure varies between 100 and 140 mm. Hg. Before treatment in all cases the normal retinal-general index was elevated. After treatment, the index remained elevated in five patients (table 2); it tended to be normalized in three pa-

TABLE 2

DIASTOLIC PRESSURE FINDINGS IN FIVE PATIENTS WITH ELEVATED RATIOS

Case	Pressure (mm. Hg)	
	General	Retinal
2	95	80
3	100	80
4	100	75
7	75	57
8	100	73

tients (table 3); and it was in these three patients that the general systolic arterial pressure showed greatest reduction after treatment (table 4).

CASE REPORTS

In order to save space, only two of the eight patients will be reported in detail.

CASE 2

Mrs. E. R. de D., aged 49 years, was at the beginning of menopause. Three years ago she suffered an acute attack of hypertension with maximum blood pressure of 290 mm. Hg. For four months there was diplopia, due to paresis of the internal rectus of the left eye, with left hemiparesia. During continued treatment both Veriloid and Raudixine were prescribed, but the blood pressure was never lower than 230 mm. Hg.

When this patient was examined at the Regional Institute of Ophthalmology, she complained of suffering from continued intense frontal headaches, loss of vision, and walking difficulty because of lack of strength in the right leg and thigh.

TABLE 3

DIASTOLIC PRESSURE FINDINGS IN THREE PATIENTS WITH RATIOS TENDING TO BE NORMAL

Case	Pressure (mm. Hg)	
	General	Retinal
1	70	40
5	70	45
6	90	40

TABLE 4

SYSTOLIC ARTERIAL PRESSURE AFTER TREATMENT IN THREE CASES REPORTED IN TABLE 3

Case	Arterial Pressure (mm. Hg)	
	Before	After
1	210	150
5	205	150
6	250	165

Eye examination showed partial neuritis of the optic nerve, dispersed hemorrhages in the retinal and toward the center of the macula, numerous punctiform cholesterol deposits around the fovea, second to third degree crossing phenomena, macular vascularization grade II, a/v caliber ratio 1:3, a small focus of angiospasm, and retinal diastolic pressure of 100 mm. Hg. These findings correspond to those of third-degree retinal arteriosclerosis.

Her physician, Dr. A. Rosales Marquez, diagnosed her condition as hypertension (blood pressure 220/120 mm. Hg), with left ventricular damage.

The hormonal treatment was maintained for 19 weeks and the results may be followed in Figure 1 where the values of the arterial pressure are shown by the two continuous lines and those of the retinal diastolic pressure by the dotted line. Figure 2 shows retinographies of the left eye (A) before treatment and (B) four months later. Slight improvement was obtained. The cholesterol deposits and the focus of angiospasm disappeared. There was slight increase of arteriolar caliber and better visualization of the macula.

CASE 5

Mrs. S. A. de P., aged 63 years, a year ago had had vertical diplopia for four months. She was a diabetic with glycosuria (28 gm. percent) and glycemia (3.12 percent), on a strict diet and daily insulin. The maximum arterial pressure was 200 mm. Hg. Electrocardiograms were normal.

Eye examination showed edema of the ret-

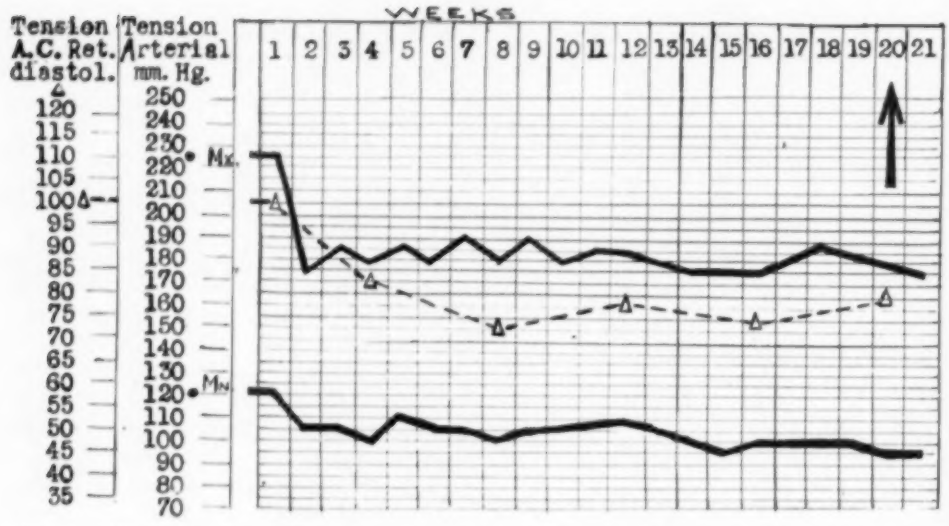

Fig. 1 (Lijó Pavía). *Case 2.* The arrow at the 20th week indicates cessation of treatment. The lower systolic pressure first obtained during the second week of treatment was stabilized at the 21st week. The dotted line represents the retinal diastolic pressure, the lowest value of which was 73 mm. Hg increasing to 80 mm. Hg in the last week.

inas, many small hemorrhages, depošits of cholesterol, microaneurysms, arteriolar-venule ratio of 1:3, retinal diastolic pressure 90 mm. Hg, third-degree crossing, and macular vascularization II. In brief, the findings showed arteriosclerosis in transition from second to third degree.

Systemic arterial pressure as determined

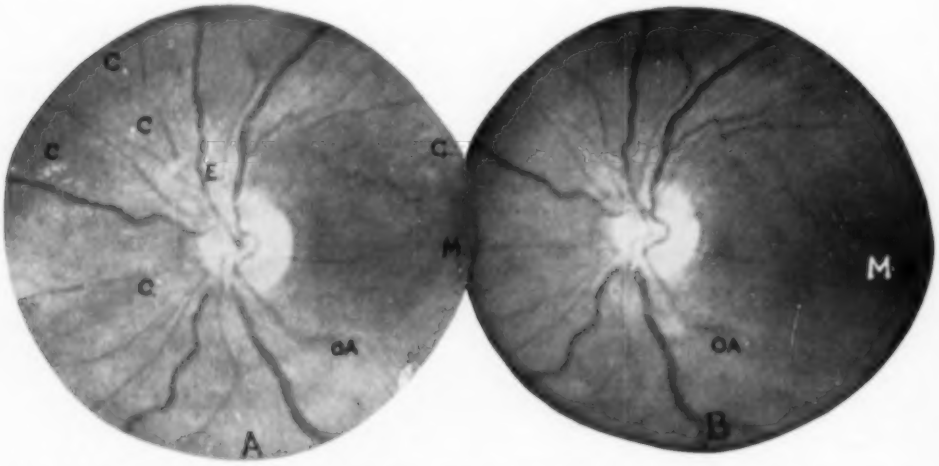

Fig. 2 (Lijó Pavía). *Case 2.* Retinographies of the posterior pole of the left eye. (A) At beginning of treatment, fundus discoloration is general. (C) Demonstrating deposits of cholesterol. (E) Point of angiospasm. (OA) Partial obstruction of arteriole. Arteriolar-venule ratio: 1:3. (B) Four months after beginning of treatment. Note disappearance of cholesterol deposits and angiospasm. Arteriolar caliber is slightly increased. Macula is clearer. The partial obstruction at (OA) has disappeared.

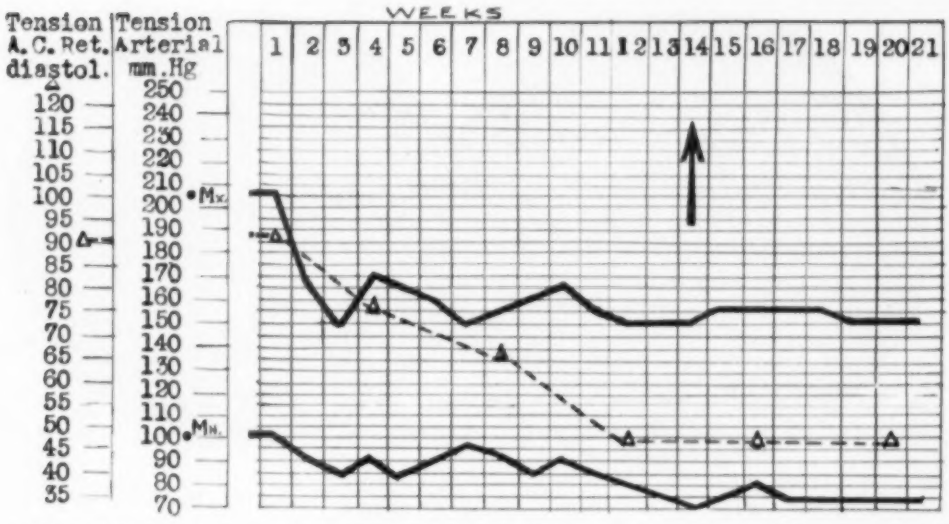

Fig. 3 (Lijó Pavía). *Case 5.* Chart showing progress during 14 weeks of treatment. Maximum arterial pressure lowered in the third week to 150 mm. Hg and stabilized at that point seven weeks after the end of treatment. Retinal diastolic pressure was lowered from 90 mm. Hg to the normal value of 45 mm. Hg in the 12th week and has been stabilized since then.

by Dr. E. Pampliega was 205/100 mm. Hg.

Figure 3 demonstrates the progress during hormonal treatment maintained for 14 weeks. The systolic arterial pressure decreased during the third week to 150 mm. Hg where it remained seven weeks after treatment was stopped. The dotted line in Figure 3 shows a definite decrease in retinal diastolic pressure from 90 mm. Hg to a normal value of 45 mm. Hg in the 16th week where it has remained to the time of writing, indicating a favorable prognosis.

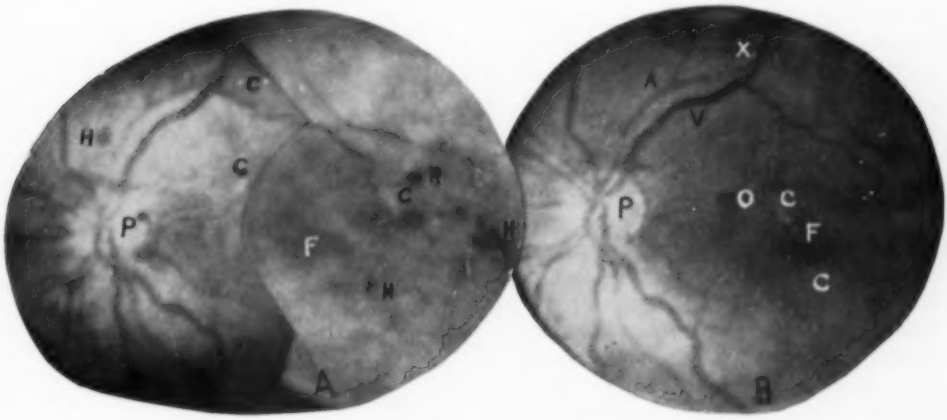

Fig. 4 (Lijó Pavía). *Case 5.* Retinographies of the left eye. (A) At the beginning of treatment. Intense edema prevents appreciation of many details. (H) Numerous hemorrhages. (C) Cholesterol deposits. (B) Three months after beginning of treatment. Clearing of edema permits more details to be seen. (P) Papilla. (C) Cholesterol deposits surrounding the fovea at the center of the macula. Arteriolar-venule ratio, 2:3. (X) Second-degree crossing phenomenon. (O) Photographic center.

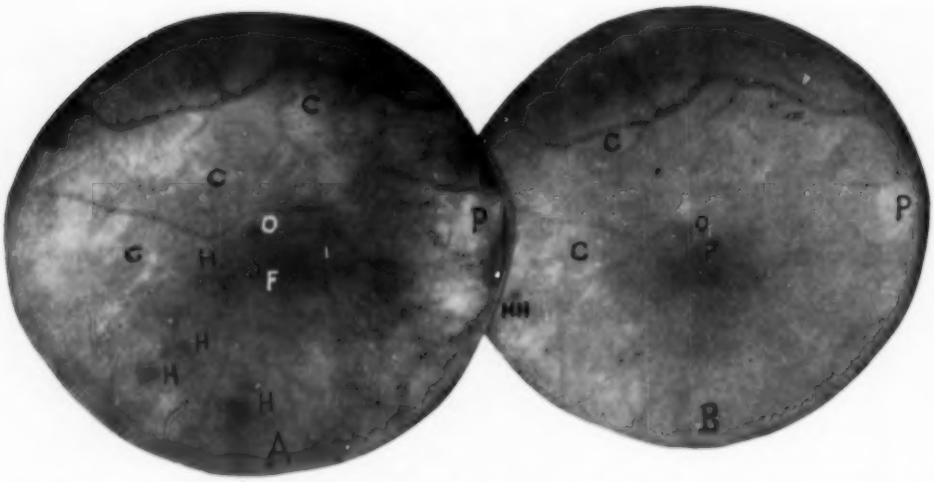

Fig. 5 (Lijó Pavia). *Case 5.* Retinographies of the right eye. (A) At the beginning of treatment. There was intense edema of the macula and perimacular region. (H) Hemorrhages. (C) Cholesterol deposits. (F) Fovea in the center of the macula surrounded by microaneurysms. (B) Three months after beginning of treatment. The edema is greatly diminished. (MH) Only one microaneurysm is observed. The cholesterol deposits have shrunk to small points. (F) The fovea in the center of the macula is free. (P) Temporal half of the papilla. (O) Photographic center.

Ophthalmoscopically, the improvement has been equally favorable. Figure 4 presents the retinographies of the posterior pole of the left eye (A) during the first week of treatment and (B) after three months.

In Figure 4-A, the intense retinal edema makes partially invisible the course of the vessels, the edges of the papilla, and the macula. There are numerous hemorrhages and some cholesterol deposits. In Figure 4-B it may be seen that these findings have cleared remarkably. Excepting at the inferior border, the papilla is more distinct. Some cholesterol is still seen around the fovea at the center of the macula. The arteriolar-venule ratio is now 2:3.

Figure 5 is retinographies of the right eye at (A) the beginning of treatment and (B) three months later. Figure 5-A shows intense retinal edema, the fovea surrounded by microaneurysms, dispersed hemorrhages, and cholesterol deposits. In Figure 5-B, there is remarkable decrease in the edema, only one aneurysm remains, and the macula is clear.

Comments

When I mention hormonal treatment I refer to that used in the experimental study on dogs of various breeds and weights carried on in collaboration with Dr. Da Graña. It is my opinion that attempts to find a treatment for arteriosclerosis should be encouraged and stimulated for it is lamentable that in an era of great scientific progress "the possibility of an adequate treatment for arteriosclerosis seems very slight." (A. Key.)[6]

The results obtained in the studies I have made point clearly toward the close relationship between the systemic arterial pressure values and those of the retinal diastolic pressure and this relationship provides an index to the state of the arteriolar-venule system, disease of which is the essence of arteriosclerosis whose vicious circle is constituted as follows:

1. Arteriolar-capillary constriction.
2. Increased blood pressure.

3. Renal arteriolar alterations and renal ischemia.
4. Freeing of the constricted vessels.

Only to begin all over again with:

1. Arteriolar-capillary constriction—and so forth, and so forth.

If the therapeutic agent used in such a condition has an intense vasodilating action and can also relax the vascular reflexes which produce arteriolar-capillary constriction (already incriminated as the initial alteration in the angiosclerotic state), it would seem apparent that increased blood pressure (the second alteration) would not be further increased and that there would be a break in the vicious circle.

Following Herraiz[7] my patients were chosen from the age group above 49 or 50 years and their maximum arterial pressure was no lower than 200 mm. Hg. In eight of the patients, the hypertension was benign and corresponded to Wezler and Boger's second type (hypertension of obstruction) produced by general narrowing of the arterioles, verified objectively in these eight patients. In Case 5, the patient was an old diabetic. Here the suggestions of Quiroz and Sauter[9] concerning the venous-arterial concomitant phenomena were verified and it was demonstrated ophthalmoscopically that the venous ectasia aggravated the arteriosclerotic state. After treatment of the arteriosclerosis, the venous ectasia was somewhat improved.

It seems paradoxic that, in spite of all that has been written on the usefulness of a knowledge of the retinal diastolic pressure, it is seldom mentioned in papers on vascular alterations, general hypertension, and cardiovascular disease. One exception is Wilbrandt's[10] study of the action of a hypotensive drug in which he mentions the retinal pressure in each case, without stating whether it is diastolic or systolic. However, from its relation to the general pressure values, one may assume he reports the diastolic retinal pressure. Wilbrandt's cases follow:

Case A. A woman, aged 58 years, 220/110 mm. Hg, fundus state III, retinal pressure 80 mm. Hg; after treatment, 180/100 mm. Hg.

Case B. A woman, aged 58 years, 210/110 mm. Hg, fundus state II to III, retinal pressure 75 mm. Hg; after treatment, 170/100 mm. Hg.

Case C. A woman, aged 56 years, 190/110 mm. Hg, fundus state II, retinal pressure 50 mm. Hg; after treatment 150/100 mm. Hg.

Although Wilbrandt makes no mention of the retinal arterial pressure after treatment, his report merits the following observation.

In Cases A and B, in which the values of the retinal arterial pressure surpass the retinal-general index, the response to treatment was not so dramatic as in Case C in which the retinal-general index was normal. This would seem to confirm the results of my study[11] on the importance of retinal diastolic pressure in the retinopathies of pregnancy in which I pointed to the prognostic significance of the lowering and stabilization of the retinal diastolic pressure.

In my eight cases herein reported, stabilization of the systemic arterial values had been maintained for one to five months at the time of this report, a result considered quite satisfactory in the light of various reports in the literature which record two to three weeks as the periods of maximum stabilization.

These observations pose the question:

Why, under apparently equal conditions, does the same medical treatment, although beneficial in every case, produce more dramatic and prolonged effects in some cases than in others?

In my opinion the answer may be found in the numerous studies of Gofman[12] on the biochemistry of the lipoproteins. Gofman and his co-workers demonstrated that routine clinical cholesterol determinations do not give the measure of alteration in the terms of the presence of giant multiform molecules and that, in vascular conditions, the physical state and size of the complex lipid molecules are more important than their number.

Utilizing ultracentrifugation, Gofman and his associates classified the lipoproteins according to the specific gravity of the molecules—the mathematical symbol of the unit of classification being Sf.

In normal man, the lipoprotein molecules were found to be within four to 10 Sf and contained in maximum about 25 percent cholesterol. However, in persons with clinical manifestations of arteriosclerosis or infarct of the myocardium, giant lipoprotein molecules of from 10 to 20 Sf, containing 80 percent cholesterol, could be demonstrated.

It must be concluded, therefore, that no investigation of a patient suspected of having arteriosclerosis is complete unless there is an ultracentrifuge investigation and classification of the serum lipoproteins according to Gofman. Upon demonstration of lipoprotein molecules of Sf values 10 to 20, any arteriosclerotic patient should be put on a strict dietetic-medical treatment with absolute rest until his retinal-general arterial index approaches normal.

Av. Quintana 104.

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LAMELLAR SCLERAL RESECTION: INDICATIONS AND TECHNIQUE

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Scleral resection aims to reduce the size of the sclera and by shortening the three ocular axes (anteroposterior, vertical, and transversal) reduce the size of the globe. These modifications, in turn, act on the radius of curvature of the cornea and from this are derived the procedure's therapeutic applications.

Lindner's technique is to do a penetrating scleral resection which leaves the choroid bare during the operation (fig. 1-A). This method presents a number of technical difficulties which make the operation dangerous and, therefore, applicable only in cases which cannot be cured by other procedures. Paufique and Shapland are responsible for the lamellar technique in which the choroid is covered by a thin layer of sclera, making the operation practically innocuous, with all the advantages of the Lindner method while evading its inconveniences (fig. 1-B).

Scleral resection was created for the treatment of retinal detachment. J. I. Barraquer Moner was the first to use the procedure for the treatment of myopic sclerochoroiditis. We have enlarged upon its use in other conditions, to be reported herein.

Indication

1. Retinal detachment

a. *In aphakics* it is important to reduce the size of the globe and compensate for the

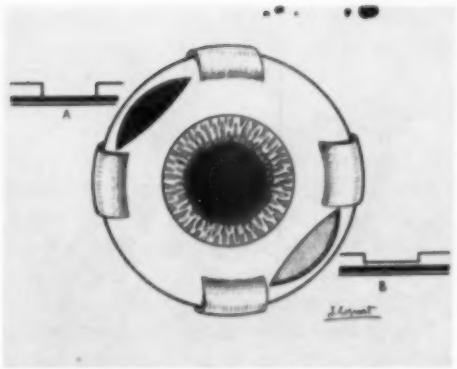

Fig. 1 (Barraquer and Muiños). Scleral resection. (A) Penetrating technique. (B) Lamellar technique.

space produced by absence of the lens, especially if there has been rupture of the hyaloid membrane or loss of vitreous. By this means the size of the globe is adapted to the contents, thus diminishing the action of the detached vitreous, so frequent in these cases.

b. *In myopes* especially in high myopia, we consider scleral resection an etiologic treatment of retinal detachment because myopia probably plays an important role in producing retinal detachment by lengthening the globe, distending the sclera (and, secondarily, the choroid and retina). This distention is not only mechanical, its action is also indirect since it impedes circulation in the choroidal and retinal blood vessels.

c. *When there is vitreous retraction,* for reasons similar to those in aphaki.

d. *In large disinsertions of the ora serrata.*

e. *First detachments in which the retina does not reattach* with bedrest, binocular occlusion, and especially with retrobulbar hyaluronidase.

f. *Cases in which the retina is again detached* after the classic operation.

g. *When electrocoagulation does not suffice,* scleral resection should be done as a second operation.

h. *In retinal detachment in senile* individuals with retinal degeneration or multiple folds.

Summarizing the indications for scleral resection in the treatment of retinal detachment, it may be seen that the cases in which it is not recommended are the exceptions.

2. High myopia with progressing sclerochoroiditis

Scleral resection is indicated when the field of vision is reduced, scotomas are present, the blindspot is enlarged, visual acuity is diminished, vitreous floaters appear, and there are macular and paramacular hemorrhages, changes which demonstrate disease of the choroid and retina, probably due to the distention and deficient blood circulation. After resection these phenomena tend to disappear and improvement in the field and visual acuity is evident. The effect of this shortening operation on the ocular dioptric power is minimal and of secondary importance (fig. 2).

3. Myopic astigmatism

The principal indication is for myopic eyes in which the lens has previously been removed in order to correct the defective refraction (greater than 18 diopters).

In these cases the indication varies and the operation is done when the following conditions are present:

a. As treatment of the myopic sclerochoroiditis.

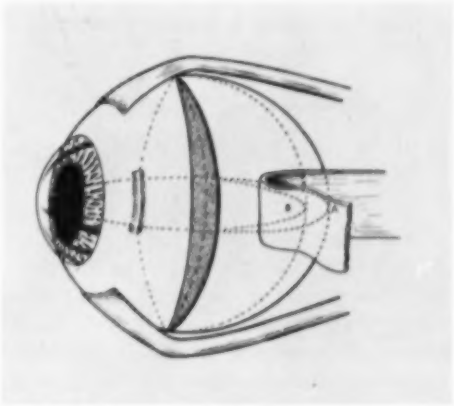

Fig. 2 (Barraquer and Muiños). Effect of operation on dioptric power.

Fig. 3 (Barraquer and Muiños). One equatorial resection is usually sufficient.

b. To adapt the size of the globe to the content which has been diminished in volume by the removal of the lens. With the resection, reducing the size of the vitreous chamber, the hyaloid comes into close contact with the retina and the posterior capsule of the lens (in linear extractions for patients less than 30 years of age), or with the posterior surface of the iris (erisophake extractions in patients older than 30 years). By this means, the pendulous movements of the vitreous within its chamber disappear.

c. Correction of the residual astigmatism. Shortening of the globe by resection modifies the corneal diameters and, in turn, the radius of curvature, producing diminution or correction of the defect.

Indications for location and type of resection

1. In retinal detachment

The resection must be done in the hemisphere which corresponds to the retinal tear. The form, size, length, and width depend on the case. Resection is usually 170-degrees long (from one horizontal muscle to the other or from vertical to vertical) and three-mm. wide, the measurements, especially the last one, depending on the size and form of the tear, the extent of the detachment, and the state of the retina.

Generally one equatorial resection is sufficient (fig. 3.). We believe it very important to place the resection as close as possible to the equator of the globe, in as much as its action on the ocular diameters increases in proportion to its proximity to the equator. The exits of the vortex veins impede many times its placement right at the equator. If it is necessary to produce maximum reduction of the volume of the globe, the resection can be crisscrossed (fig. 4), with a meridional resection perpendicular to the anterior one which goes from the ora serrata to the most posterior portion which the operating field permits (15 to 20 mm.).

2. In high myopia

a. If the lesions predominate in one hemisphere, resection is done in that hemisphere.

b. If the lesions are diffuse resection is done in the hemisphere most favorable for the astigmatism, thus correcting the astigmatism, as well as treating the lesions.

In high myopia with sclerochoroiditis the resections should not be very wide because the anterior chamber does not drain suffi-

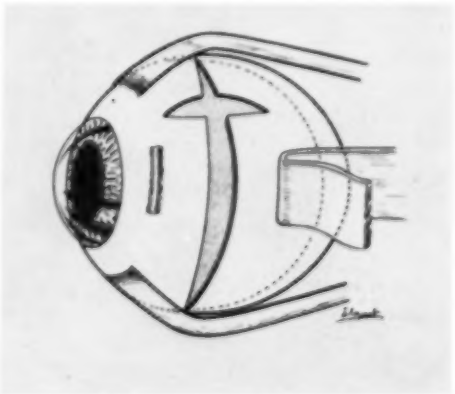

Fig. 4 (Barraquer and Muiños). In cases in which it is necessary to produce maximum reduction of the volume of the globe, the resection can be crisscrossed.

ciently to permit easy coaptation of the lips of the resection. If that happens diathermic puncture is done at the level of the resection and a little vitreous humor is evacuated; however, it is better not to have to do this. The less extensive resections are preferable, repeated in the different sectors with intervals of three to four months between operations. By this means a circular resection can be done in three or four steps.

In high myopias the crisscross resection is recommended.

3. For the correction of astigmatism

With scleral resection we correct astigmatism of three and four diopters, the correction depending on its extent and location.

The extent should be proportional to the diopters. The topography of the resection is the opposite of what seems logical. It would seem that the resection should be effected perpendicular to the more refringent axis and cutting it would reduce its dioptric power. However, the opposite happens. The principal factor acting in this case is the variation in the corneal curvature (fig. 5). When the radius in an axis is decreased, the dioptric power is increased (fig. 6-B). Therefore, resection should be perpendicular to the axis of least refringency; both axes will tend to be equalized, lessening or correcting the astigmatism (fig. 7).

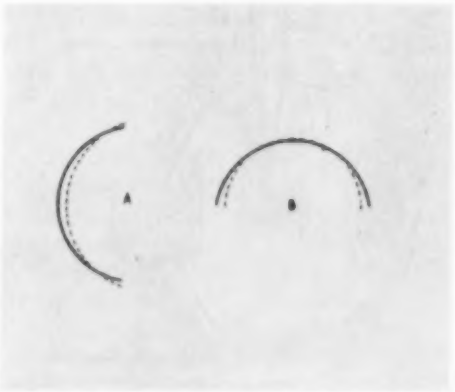

Fig. 6 (Barraquer and Muiños). When the radius of an axis is decreased the dioptric power is increased.

Technique

1. Preparation

The patient should be thoroughly sedated to stabilize the neurovegetative system and lessen the danger of vasomotor problems and annoying reflexes.

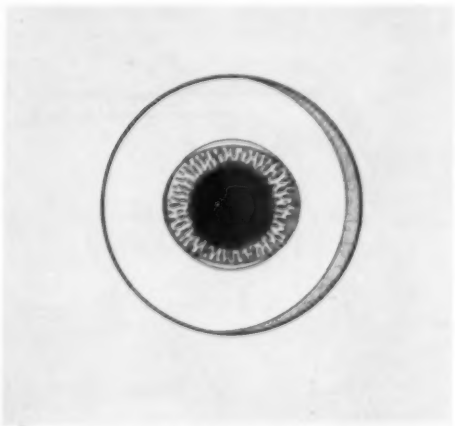

Fig. 5 (Barraquer and Muiños). In astigmatism, the principal factor to consider is the corneal curvature.

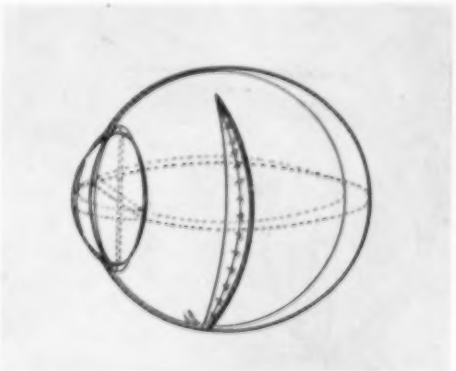

Fig. 7 (Barraquer and Muiños). In astigmatism, resection should be perpendicular to the axis of least refringency.

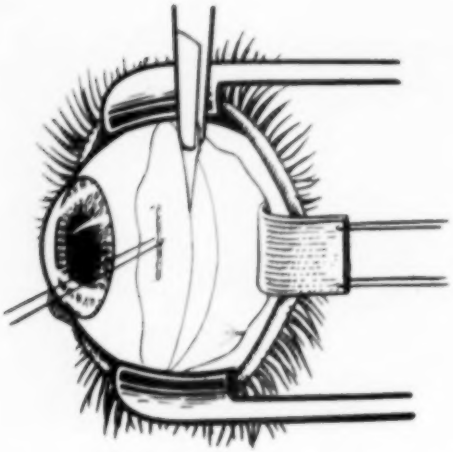

Fig. 8. (Barraquer and Muiños). Because of the irregularity in scleral thickness, great care must be used in this step.

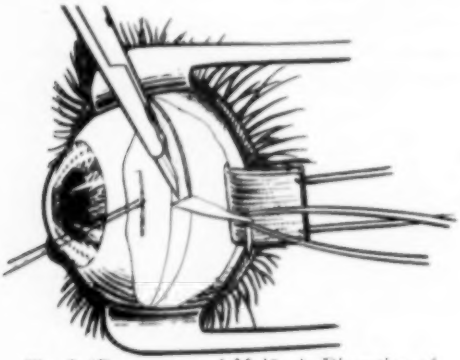

Fig. 9 (Barraquer and Muiños). Dissection of the deeper layers of the sclera.

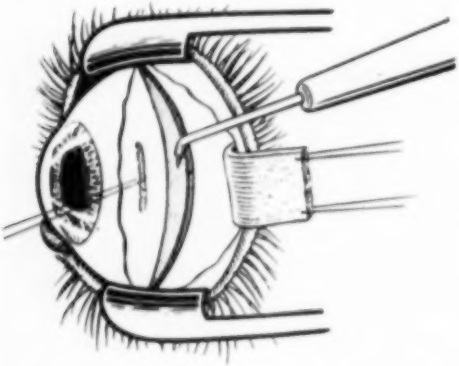

Fig. 10 (Barraquer and Muiños). Diathermy puncture of the sac.

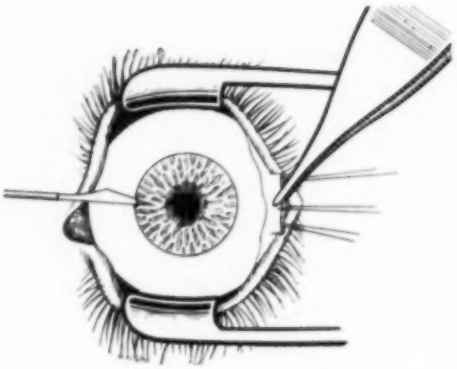

Fig. 11 (Barraquer and Muiños). Paracentesis of the anterior chamber is performed and the aqueous humor is evacuated slowly.

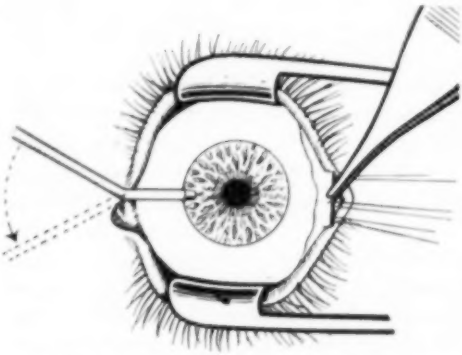

Fig. 12 (Barraquer and Muiños). Paracentesis may be repeated as many times as necessary.

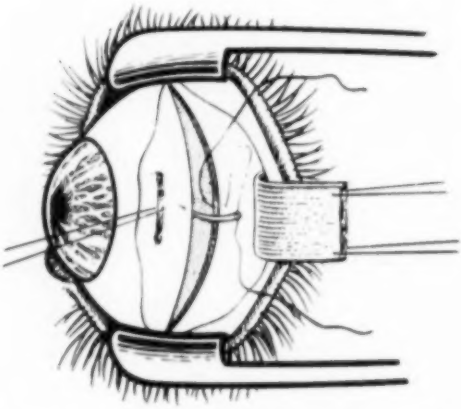

Fig. 13 (Barraquer and Muiños). Suturing the sclera.

2. Anesthesia

a. Repeated instillations of 10-percent cocaine.

b. Retrobulbar injection of a two-cc. solution of procaine-adrenaline-hyaluronidase gives good, deep anesthesia of sufficient duration.

3. Preliminary operative steps

a. *Incision.* It is convenient to incise the conjunctiva and capsule of Tenon as far posterior as possible near the bottom of the sac; this will also hide the small conjunctival scar and the muscular insertion will be well covered.

b. *Section* of the muscle or muscles of the corresponding zone. After separating and dissecting its tendon, two cotton sutures (No. 80) are placed one mm. from the scleral insertion and fixed in the operating field so they do not interfere during the remaining intervention. With scissors, or better with the electric scalpel, the tendon is sectioned between the sutures and the sclera.

A traction suture is then placed at the original site of insertion; this serves to move the globe in the desired directions throughout the operation.

We make certain that the sclera is bare and without episcleral remnants. A search is made for the exits of the vortex veins to ascertain their topography and avoid damaging them.

4. Scleral resection

a. *Delimitation.* As soon as the zone is free, it is limited with a scalpel (a fragment of razor blade mounted in a Kalt needleholder), and then deepened to three fourths of the scleral thickness. Since the scleral thickness is irregular, this step must be done with the utmost care in order not to perforate this structure and produce lesions in the choroid (fig. 8). (Under the lateral rectus muscle the sclera is very much thinner; in the external inferior quadrant, it is very thick, and so forth.)

b. *Resection.* With the same blade we proceed to dissect the deeper layers of the sclera in such a manner that the choroid becomes visible, taking care not to perforate these last layers, especially the choroid (fig. 9).

c. *Evacuating puncture.* In retinal detachment cases, diathermy puncture of the sac is done preferably in the resected zone (fig. 10).

A paracentesis of the anterior chamber is performed and the aqueous humor is evacuated slowly. (fig. 11). This can be repeated as many times as may be necessary (fig. 12). In aphakics, it is essential to have good miosis in order to avoid rupture of the hyaloid and loss of vitreous humor.

d. *Suture of the sclera.* Side-by-side stitches are made with cotton thread (No. 80) (fig. 13). Only one turn of the suture is made in order to facilitate its closing. If there is difficulty in coaptating the lips of the resection, this can be remedied by tightening the sutures patiently in a progressive manner, evacuating the anterior chamber as necessary. If the suture tends to become loose, the assistant holds it with forceps while the second turn is made.

Normally one suture every two mm. is necessary. The intervals are made smaller if the sclera is fragile, a frequent occurrence in previously operated retinal detachment cases.

e. *Electrocoagulation.* In retinal detachment this procedure is checked with the ophthalmoscope as in other methods without resection (figs. 14 and 15). Our policy is to do light electrocoagulation and intensify it at the level of the tears. Electrocoagulation must be used throughout the resected area and at the extreme ends in order to flatten them for they tend to become staphylomatous. Being very superficial, the action is limited to the sclera without reaching the retina.

f. *Muscle reposition.* We fix the muscle or muscles sectioned in their previous insertions, making use of the sutures which were previously placed. The sutures are covered by the capsule and conjunctiva and there is

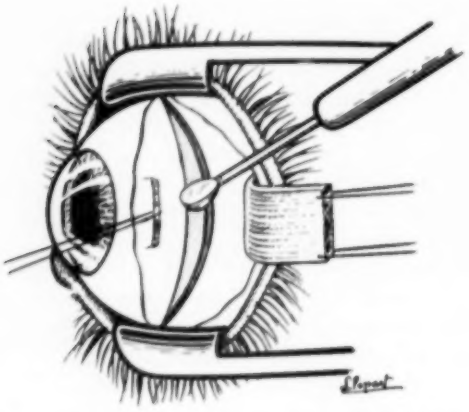

Fig. 14 (Barraquer and Muiños). Electrocoagulation in retinal detachment is checked with the ophthalmoscope.

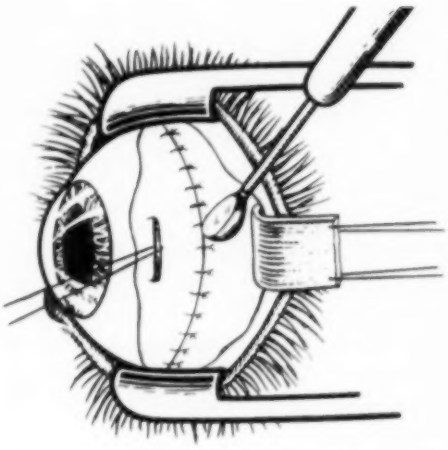

Fig. 15 (Barraquer and Muiños). Electrocoagulation is intensified at the level of the tears in retinal detachment.

no need to remove them if the conjunctival incision has been made posterior to the muscle insertion.

g. *Suturing of capsule and conjuctiva* is done carefully in two planes with discontinuous sutures to attain normal anatomic and functional conditions of these membranes.

5. Postoperative

Ten days of rest are ordered, as for any ocular surgery involving scleral resection. In retinal detachment the postoperative period should be the same as that following more simple techniques.

The edema and conjunctival chemosis disappear after a few days. Many cases present postoperative retinal edema which disappears in 10 or 15 days without requiring treatment.

Summary

Scleral resection is indicated:

1. In retinal detachment:
   a. In aphakics.
   b. In myopes.
   c. In vitreous retraction.
   d. In big disinsertions of the ora serrata.
   e. When the sac does not reapply itself.
   f. Relapses.
   g. Not cured by the classic methods.
   h. In senile individuals with retinal degeneration.
2. In high myopia with progressive sclerochoroiditis (vitreous opacities, narrowing of the field of vision, diminution of visual acuity, retinal hemorrhages).
3. After the operation of Fukala in order to correct the residual astigmation and treat the sclerochoroiditis.

The localization depends on:

1. The topography of the retinal detachment.
2. The zones of retinal injury.
3. The axis of the astigmatism.

The technique is easy and without danger. It is very important to place the resection as close as possible to the equator of the globe.

Take care not to injure the vortex veins.

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EXPERIMENTAL STUDY OF CORNEAL LESIONS*

Produced by topical anesthesia

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Introduction

Soon after Köhler first reported the use of cocaine as a topical anesthetic for the eye, it was learned that this agent readily produces erosion of the corneal epithelium. In spite of this, topical cocaine anesthesia of the eye was used until around 1930 when the International Narcotic Acts made the drug more difficult to obtain.

Beginning with Einhorn's investigations in 1892 (crowned by his discovery of procaine [novocaine] in 1905), search for synthetic cocaine substitutes has continued. When procaine proved to be a poor surface anesthetic, workers discovered drugs like Neotutocaine (Pantocaine or Tetracaine) to substitute for topical cocaine.

Since these new drugs were nonhabit-forming and, so it was thought, did not produce corneal lesions, they were prescribed freely for home use to relieve chronic and acute eye pain. However, even as early as the 1930s, there appeared cases of corneal lesions whose etiology seemed to be the uncontrolled use of these anesthetic agents.

Report of early cases

During the years 1934 and 1935, my father observed the following cases:

Case 1

In order to remove a chalazion, an ophthalmologist anesthetized the conjunctiva of a patient's lower lid by instilling a four-percent solution of Neotutocaine and by pressing a roll of cotton, moistened in the same solution, on the site. When, on the next day, the patient showed an erosion of the corneal epithelium, it was thought to be caused by abrasion from the cotton roll or by abrasion from the bandage.

Since the erosion was very painful, four-percent Neotutocaine every two hours was prescribed for home use. When the patient returned 14 days later, the erosion had increased in size and there was a grayish infiltration of the cornea. The patient complained of intense pain but the cornea was insensitive to touch. The patient stated that he had begun use of the anesthetic as prescribed but that, when the drops began to have a shorter effect, they were used at more frequent intervals until they were being instilled every 10 minutes. Even with that frequency, he was unable to get relief from pain.

The erosion healed with difficulty. Growing loosely from the borders, the epithelium became easily and frequently detached. Cicatrization was complete only after months; the pain subsided and sensitivity returned at about the same time. Scar formation reduced the previously normal vision to 1/10.

Case 2

An ophthalmologist who suffered from superficial punctate keratitis, used a four-percent solution of Neotutocaine to relieve pain and photophobia. The anesthetic was instilled every time the pain started. After two weeks, it was being instilled every 15 minutes with no relief. By that time there was an extensive erosion of the corneal epithelium and he was suffering great pain but the cornea was insensitive to touch. The anesthetic drops were discontinued but it took months for the erosion to heal, leaving no scars. Pain subsided and sensitivity returned at about the time healing was complete.

Case 3

A nervous patient with a burn of the cornea caused by hot fat was prescribed a four-percent Neotutocaine solution to be used at home every two hours. The burn was quite superficial and the anesthetic was prescribed only to soothe the patient. Because he was afraid of pain, he began to use the drops at shorter intervals. Soon pain returned more quickly and drops were used more frequently—after about 10 days, they were being instilled at 10-minute intervals with no effect.

By this time, there was a large corneal erosion with grayish infiltration of the cornea. Pain was intense and the cornea insensitive to touch. After months, the erosion was healed with difficulty; the epithelium grew loosely from the borders, becoming easily and frequently detached. At about the end of the healing period, pain ceased and corneal sensitivity returned. Scar formation reduced the previously normal vision to 5/10.

At the time these three cases were seen, it was thought that the erosion was due to too

* This work was done at the Experimental Institute of the Medical School of Porto Alegre.

high a concentration of the anesthetic. The manufacturers then decreased the recommended concentrations from 2.0 to 4.0 percent to 0.5 to 2.0 percent, and warned against the ophthalmic use of solutions stronger than two percent. However, when other corneal erosions due to careless use of topical anesthesia began to appear, it was shown that solutions of two percent and under were also dangerous.

Eichholtz says that all the commonly used topical anesthetics may cause corneal damage. Marchesani even considers it to be a medical error to prescribe topical anesthetics for prolonged home use. Schmöger reports five cases of erosions and reviews the pertinent literature.

In recent years my father has observed three cases of corneal erosion caused by weaker solutions of topical anesthetics:

CASE 1

A patient suffering with glaucoma was given a 0.5-percent solution of Neotutocaine to be instilled at home every two hours. As the effect of the drops became shorter, the patient began to instil them at more and more frequent intervals. In two weeks she was using them every 10 minutes. Even this frequency did not alleviate the pain, which was actually increased by the drops.

At examination, there was an extensive erosion. She complained of severe pain but the cornea was insensitive to touch. The erosion was healed with difficulty, the epithelium, growing loosely from the borders of the erosion, detached itself easily and frequently. Concomitant with healing, pain subsided and corneal sensitivity was regained. Cicatrization was not complete for several months but there were no residual scars.

CASE 2

A two-percent Neotutocaine solution every two hours was prescribed for a patient with traumatic lesions of the cornea. After using the drops for one day, he began to instil them every 30 minutes. The pain had increased somewhat in this short period. He stopped using the anesthetic but two days later had an erosion of the corneal epithelium and complained of pain more severe than that produced by the trauma; however, the cornea was insensitive to touch. The erosion healed in a week, leaving no scars. Pain subsided and corneal sensitivity returned during this time.

CASE 3

A patient with an ulceration at the corneal limbus instilled a two-percent Neotutocaine or a five-percent cocaine solution every two hours without regard to the order of application. After seven days, two thirds of the corneal epithelium was eroded, there was extensive ulceration at the limbus, and the entire cornea was painful but insensitive to touch. After discontinuing the drops and under proper treatment, the ulceration healed in two days. The erosion became progressively smaller and disappeared after seven days, leaving an area of loose epithelium which cleared after 17 days; there were no residual scars. The sensitivity to touch returned, starting at the limbus and moving toward the center of the cornea, but it was 24 days before there was complete sensitivity.

The main purpose of the experiments herein reported was to show that topical anesthetics really do lose their effect after a prolonged period of instillation.

EXPERIMENTAL STUDY

PROCEDURE

Rabbits not previously used for experimental purposes were selected and a drop of anesthetic solution was instilled each time the effects of the previous administration were ended. The eye was considered to be anesthetized when no sign of the corneopalpebral reflex was apparent on touching the cornea with a wisp of cotton; anesthesia was ended when the reflex began to reappear.

Because rabbits have the habit of blinking when they see a wisp of cotton, this part of the experiment had to be done very carefully. When there was any doubt, two or three trials were made. The cornea was actually touched only two or three times.

The anesthetic was considered to be without effect when two drops, instilled at one-minute intervals, failed to inhibit the corneopalpebral reflex for a period of at least one hour. (When the anesthetic is effective, the reflex usually vanishes in less than one minute.)

For each anesthetic solution, a series of four rabbits was used; I worked with two at a time, using one eye for the instillation. When the experiment was extended over more than one day, the solution was instilled for eight hours of each day. Table 1 surveys the experiments.

TABLE 1

DATA OBTAINED FROM RABBIT EXPERIMENTS

Anesthetic Used	Rabbit	Length of Anesthesia	No. Drops Instilled†	Mean Period Anesthesia‡ (min.)	Mean Period Anesthesia§ (min.)	Maximum Anesthesia of One Drop (min.)	Erosion Healed (days)	Sensitivity Returned (days)
Neotutocaine 2%	1	8+4.50*	28+47	21.8	1.9	41	9	13
	2	8+4.49	22+44	24.8	4.4	38	Died	Died
	3	8+1.17	23+7	17.0	12.3	51	1	7
	4	8+0.30	37+5	13.4	8.8	43	Died	Died
Neotutocaine 0.5%	1	7.19	101	9.4	4.4	15	3	8
	2	5.49	64	9.3	2.9	16	2	8
	3	5.56	76	6.5	8.1	25	1	4
	4	4.42	47	9.7	5.8	17	2	4
Cocaine 10%	1	7.07	32	18.6	8.5	45	2	4
	2	7.11	29	15.4	8.8	30	2	4
	3	4.28	24	17.2	5.6	42	2	1
	4	4.54	25	18.0	6.8	49	2	1
Nupercaine 0.2%	1	8+0.18	20+4	27.5	15.1	68	Died	Died
	2	8+0.18	19+4	27.6	17.6	53	1	10
	3	6.06	20	25.8	9.8	57	1	1
	4	4.43	11	40.4	13.8	50	1	1

* 8+4.50=8 hr. 1st day; 4 hr., 50 min., 2nd day.
† To time anesthetic lost its effect.
‡ Per drop of first 10 drops.
§ Per drop of last 10 drops.

ANESTHETICS STUDIED

A. *Two-percent Neotutocaine in distilled water* (graph 1)

The effect of the first drops usually lasted for a longer period than that of latter instillations. The effect became shorter in an irregular but progressive manner as more and more drops were instilled, until finally the effect vanished. There was then a period of about two hours during which the eye was sensitive but did not react to the anesthetic. Then the eye became insensitive without further application of the anesthetic. The results for the four rabbits of this series were:

RABBIT 1. Twenty-eight drops were instilled during eight hours of the first day; 47 drops during four hours and 50 minutes of the second day when the anesthetic had no more effect. Later, an erosion completely covered the cornea which had become insensitive. Fluorescein staining verified the erosion and a wisp of cotton was used to verify the insensitivity. During nine days, the erosion became progressively smaller and healing took place. Sensitivity did not return until the 13th day, although the insensitive area had become progressively smaller as the erosion diminished.

RABBIT 2. During eight hours of the first day, 22 drops were instilled, and 44 drops were used in four hours and 49 minutes of the second day (total 66 drops), at which time the anesthetic had become ineffective. The erosion covered the entire surface of the cornea which had become completely insensitive.

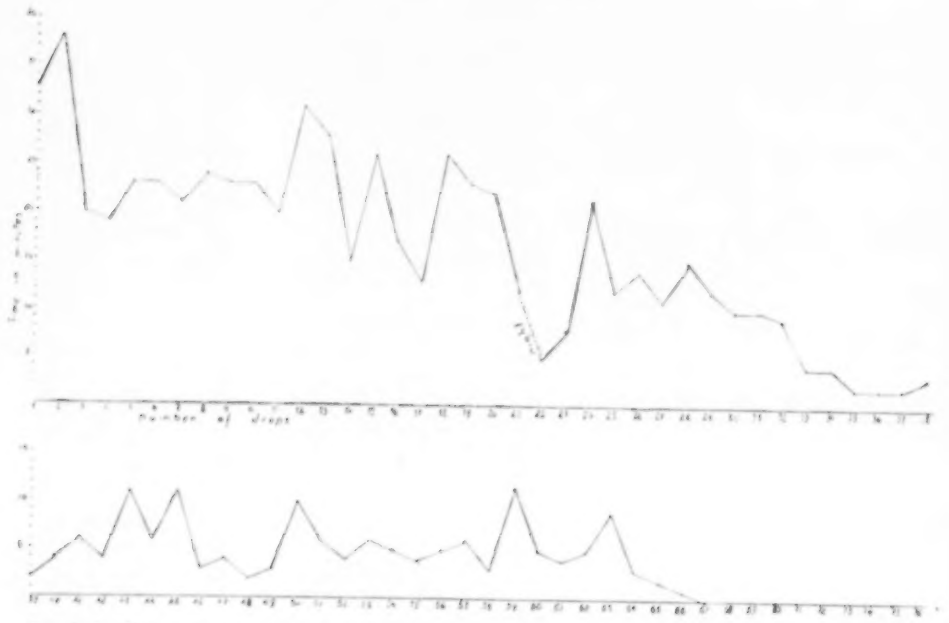
Unfortunately, the rabbit died on the 14th day, at which time about one-fourth of the eroded area and one third of the insensitive area remained.

RABBIT 3. Twenty-three drops were instilled during eight hours of the first day and seven drops in one hour and 17 minutes of the second day. The anesthetic now had no more effect. An erosion covered about one tenth of the cornea but about nine tenths of the cornea became insensitive. The erosion healed in one day; the insensitivity did not disappear for seven days.

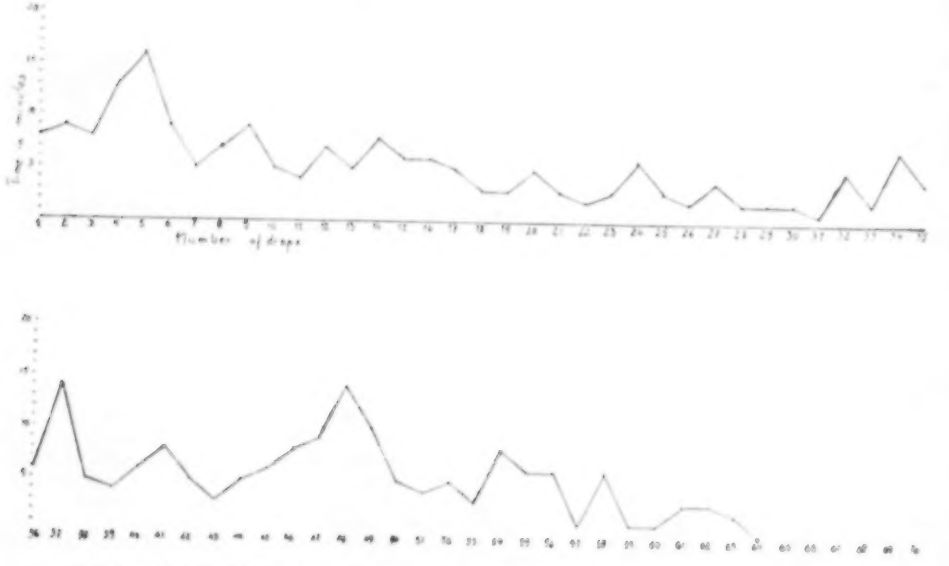
RABBIT 4. During eight hours of the first day, 37 drops were instilled. After five drops in one-half hour on the second day, the anesthetic began to lose its effect. The cornea was eroded to one fifth of its extent, followed by complete insensitivity. The rabbit died on the second day.

B. *0.5-percent Neotutocaine in distilled water* (graph 2)

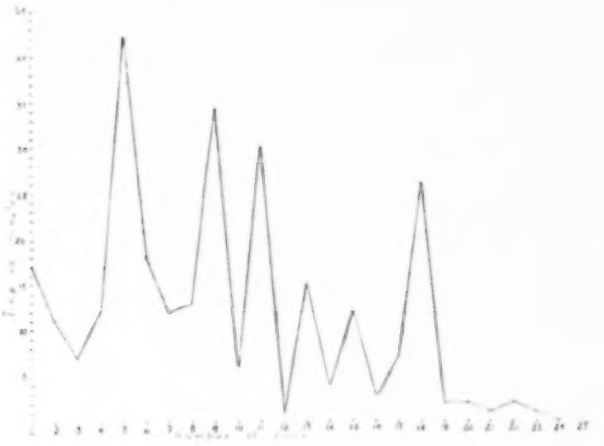
In this experiment, also, the effects of the first drops instilled were longer lasting than those of later instillations. The difference



Graph 1 (Behrendt). Neotutocaine, two percent. Rabbit 2. Abscissa gives the cumulative number of drops at each successive instillation. Ordinate, time of anesthesia in minutes for each drop. For example, drop 11 produced anesthesia that lasted 20 minutes.



Graph 2 (Behrendt). Neotutocaine, 0.5 percent. Rabbit 2. (See graph 1 for explanation.)



Graph 3 (Behrendt). Cocaine, 10 percent. Rabbit 3. (see graph 1 for explanation.)

was not so marked in this experiment as in that with the two-percent solution; the maximum effect was much less intense. Although more drops of the 0.5-percent solution were administered, the duration of anesthesia was shorter. In this experiment, too, the cornea became insensitive about two hours after the anesthetic lost its effect. The results in the four rabbits studied were:

Rabbit 1. A total of 101 drops was administered in seven hours, 19 minutes when the anesthetic lost its effect. About this time, one half of the cornea became eroded, the area of erosion afterward becoming insensitive. The erosion healed in three days; the insensitive area in eight days.

Rabbit 2. During five hours and 49 minutes, 64 drops of the anesthetic solution were instilled. The effect of the anesthetic was then lost. About one third of the cornea showed erosion, the area of erosion later becoming insensitive. The erosion healed in two days but, although the insensitivitive area became progressively smaller—always following but never catching up with the diminishing erosion—full sensitivity did not return for eight days.

Rabbit 3. Seventy-six drops of the anesthetic were instilled during five hours and 56 minutes when the anesthetic lost its effect. Although the area of erosion covered one third of the cornea, only two thirds of the eroded area later became insensitive. The erosion healed in one day. The insensitivity diminished gradually and disappeared in four days.

Rabbit 4. After 47 drops during four hours and 42 minutes, the anesthetic lost its effect. As in Rabbit 3, about one third of the cornea became eroded and two thirds of this area showed insensitivity. The erosion healed in two days, the insensitive period disappearing in four days.

C. *Ten-percent cocaine solution in distilled water* (graph 3)

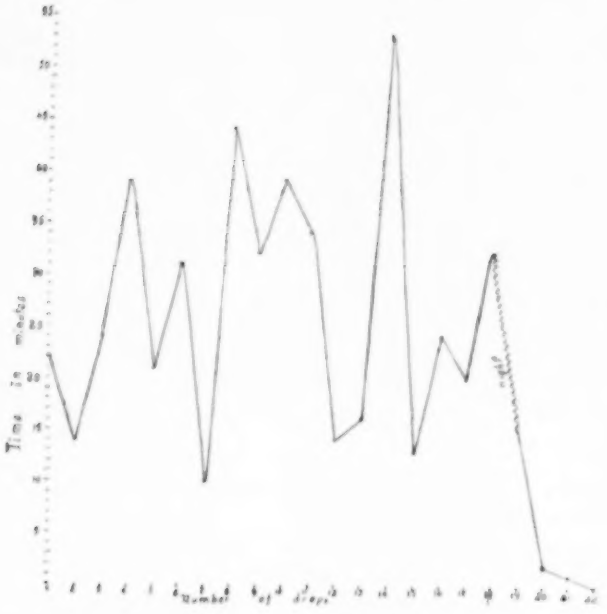
The first few drops instilled produced much the same effect as that of two-percent Neotutocaine; however, the effect of the last drops of cocaine disappeared rather abruptly and the stage at which this agent no longer produced anesthesia was reached much more quickly than with two-percent Neotutocaine. Following a period (two hours) during which the anesthetic had no effect, the cornea became insensitive without further drops, the same findings as with both concentrations of Neotutocaine. The results with these four rabbits were:

Rabbit 1. After 32 drops were instilled during seven hours and seven minutes, the anesthetic effect could no longer be produced. An area of two thirds of the cornea became eroded but all of the cornea grew insensitive. The erosion healed in two days; insensitivity gradually diminished and disappeared in four days.

Rabbit 2. The anesthetic lost its effect after 29 drops were instilled during seven hours and 11 minutes. The erosion, covering one half of the cornea healed in two days. The corresponding insensitive area was gone in four days.

Rabbit 3. After the anesthetic lost its effect following instillation of 24 drops in four hours and 28 minutes, an erosion of about one eighth of the cornea appeared but all of the cornea later became insensitive. The erosion healed in two days; the insensitive area disappeared in one day.

Rabbit 4. Twenty-five drops were instilled during four hours and 54 minutes, then the anesthetic became ineffective. The eroded one fifth of the



Graph 4 (Behrendt). Nupercaine, 0.2 percent. Rabbit 2. (See graph 1 for explanation.)

cornea later became insensitive. Although the insensitivity disappeared in one day, the erosion took two days to heal.

D. *0.2-percent Nupercaine in distilled water* (graph 4)

The over-all results were similar to those after 10-percent cocaine, the difference being that the effect of the first drops lasted longer and the point at which the anesthetic effect vanished after the final drops came much more abruptly. As with the other solutions, after the anesthetic lost its effect, there was a period of sensitivity before the cornea became insensitive. The four rabbits in this series showed these results:

Rabbit 1. During eight hours of the first day, 20 drops were instilled. On the second day, after instillation of four drops in 18 minutes, the anesthetic lost its effect. One half of the cornea became eroded but all of it became insensitive. The rabbit died a day later.

Rabbit 2. On the first day, 19 drops were instilled during eight hours. Four drops were instilled during 18 minutes on the second day, after which the anesthetic was no longer effective. One half the cornea was eroded but all of it became insensitive. The erosion healed in one day; the insensitivity gradually diminished, disappearing in 10 days.

Rabbit 3. Twenty drops were instilled during six hours and six minutes. The anesthetic then lost its effect. About one fifth of the cornea became eroded, the area of erosion later growing insensitive. Both the erosion and the insensitivity disappeared in one day.

Rabbit 4. The anesthetic lost its effect after instillation of 11 drops during four hours and 43 minutes. The area of erosion, about one fifth of the cornea, later became insensitive; both disappeared in one day.

Discussion

Although the quantitative results varied considerably with the different anesthetic solutions and the different rabbits of each series, the qualitative results followed the same pattern:

Further instillations of the anesthetic agent after anesthesia ceased showed progressive diminishing of the anesthetic effect until finally the effect was completely lost. This would seem to explain why, when anesthetic drops are prescribed for home use at one-hour or two-hour intervals, the patient ignores the directions and begins to use the drops at more frequent intervals in order to relieve his pain and goes on increasing the

frequency until he is using the drops every 10 to 15 minutes without relief.

This study would seem also to confirm that synthetic anesthetic agents are as capable as cocaine of producing corneal erosions.

It would seem that the loss of the anesthetic effect, the period of sensitivity directly following loss of the effect, and the subsequent prolonged period of insensitivity must be due to a lesion of the corneal nerves caused be the anesthetic agent.

From these observations, it must be concluded—and emphasized—that the practice of prescribing anesthetic solutions for home use by the patient is dangerous. In my opinion, Marchesani's stand, that it is a medical error to prescribe topical anesthetics for prolonged home use, is absolutely justified—in addition to causing erosions, the anesthetics lose their effect which may lead to excessive dosage when the patient is left to his own discretion, resulting in sensory damage to the cornea.

SUMMARY

Following clinical observation of corneal lesions caused by indiscriminate use of topical anesthetics, a study was made of the effect of various anesthetic agents on rabbit eyes. It was shown that, after prolonged administration, the anesthetic effect of the agents studied was lost, and that, even after cessation of treatment, material and sensory damage persist.

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I wish to express thanks to the Pharmacology Department of the Medical School of Porto Alegre for the cocaine; the Bayer Laboratory for the Neotutocaine; the Ciba Laboratory for the Nupercaine. My gratitude is expressed to Dr. Manoel Loforte Gonçalez, Director of the Experimental Institute of the Medical School of Porto Alegre, without whose help this work could never have been completed.

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CENTRAL ANGIOSPASTIC RETINOPATHY*

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A review of the literature reveals few reports on central angiospastic retinopathy in the United States and Europe. This condition, however, is frequently seen in Japan and was first described by Masuda in a series of papers; the first of these being published in 1915. Since that time, the condition has frequently been referred to as "Masuda's central serous chorioretinitis" in Japan.

According to Masuda, this disease usually affects one eye of middle-aged males. The patient complains of a slight disturbance in the vision, a central scotoma, a micropsia, and a metamorphopsia.

The central scotoma is usually positive and relative and round in shape. It is apt to rise upward with time as the subretinal exudate sinks downward. An absolute scotoma is sometimes found at the center or a little to the side toward the top of the relative scotoma.

Examination may reveal a slight hyperopia. By a fundus examination, an edematous swelling which is actually a serous detachment of the retina is found. The swelling is usually well defined and round in shape.

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Other parts of the fundus are normal and vitreous opacities are not found. The sero-reaction is negative in general. Masuda's findings were later confirmed by Hasegawa[4] (1932) and by Kitahara[5] (1933).

During the past two-year period, we have observed 51 cases of this condition. By slit-lamp observation of the fundus, some interesting findings were obtained.

General observations

Age and sex

The disease usually affects men of about 40 years of age. Hasegawa reports that men are affected five times more frequently than women; according to Kitahara, about twice as frequently. Our experience indicates that in the 1930s and early in the 1940s men were affected four to five times more frequently than women and about 80 percent of the patients were in the age range of from 35 to 45 years. In the 1950s, however, women as well as younger persons were affected more frequently. The present series of 51 cases indicates that the ratio of men to women is 37:14; the age range is: in one case under 25 years, in 21 cases between 26 and 35 years, in 19 cases between 36 and 45 years, and in the last 10 cases over 46 years of age.

Visual disturbance

The visual disturbance is usually slight and vision (with glasses) of less than 20/200 was not found in our cases. A vision of 20/20 is not exceptional although the patient complains of a visual disturbance (table 1).

Good vision can be restored after cure. A vision of 20/20 or more was restored in 14 of our 23 cases in which the course was followed until a quiescent stage was reached. In six cases, the final vision was 20/30 and in three cases 20/40. Other patients returned to their own physicians during the treatment or are still under observation and the final vision is unknown.

Micropsia and metamorphopsia

In 44 of the 51 cases, a micropsia was demonstrated. This is due to an edematous swelling of visual cell layer. The degree of the micropsia was measured, using a prism and a scale. In seven of 44 cases, the size of the object recognized by the affected eye was smaller than 84 percent of that by the normal eye; in nine cases it was 85 to 89 percent; in 23 cases 90 to 94 percent; and in five cases 95 to 99 percent.

Forty-three* of the 51 patients complained of a metamorphopsia. We measured the metamorphopsia by using Amsler's grid[6] and classified it as: convex, concave, arc, and irregular (figs. 1, 2, and 3). Each form was further subdivided into single (meridional) and double (over-all) form.

The single concave form was found in three eyes;† double concave form, 11 eyes; convex form, none of the eyes; single-arc form, four eyes; double-arc form, two eyes; Singular irregular form, nine eyes; double irregular form, 15 eyes.

During the course of the disease, the form of the metamorphpsia is, of course changeable.

Hyperopia

A slight hyperopia is usually found in this condition and is due to an advancement of the visual cell layer by a detachment. However, in this type of retinal edema, which will be discussed later, a hyperopia is uncommon.

In our series of cases, the degree of the hyperopia was calculated by a comparison of the refraction between the affected and nonaffected eye. Such a calculation gives, of course, only a general idea of the problem because the accurate figure can only be obtained in cases in which no anisometropia existed before the onset of the disease. Hy-

* The number of the eyes was 44; in one case the affection was bilateral.

† Statistics on the first examination.

TABLE 1

CLINICAL FINDINGS IN CENTRAL ANGIOSPASTIC RETINOPATHY

(The findings when first examined)

No.	Name	Age (yr.)	Sex	No. of Attacks	Duration of Present Attack When First Examined	Vision with Glasses	Degree of Hyperopia (diopters)	Percentage Micropsia (percent)	Metamorphosia	Central Scotoma (white)	Fundus Findings		T.B. History	Serum Reaction	Tuberculin Reaction
											Form of Affection	Vessel Shadow			
1	T.A.	35	M	1	2 mo.	20/50	0.0	87	Single irreg.	Pos. rel.	Ser. detach.	+	+	−	+
2	N.M.	41	M	1	5 da.	20/40	+1.0	90	Single arc	Pos. rel.	Irreg.	+	+	−	+
3	K.E.	36	F	1	10 da.	20/70	+1.5	80	Double concave	Pos. rel.	Ser. detach.	+	−	−	+
4	Y.H.	33	M	1	3 da.	20/25	−0.25	87	Single irreg.	Pos. rel.	Almost normal	−	−	−	+
5	H.T.	52	M	1	7 wk.	20/70	−0.5	87	Double concave	Pos. abs.	Ret. edema	−	−	−	+
6	M.F.	40	M	1	6 wk.	20/50	0.0	90	Single irreg.	Pos. rel.	Ret. edema	−	−	−	+
7	H.K.	33	M	1	10 da.	20/25	+0.25	90	Double concave	Pos. rel.	Ser. detach.	+	+	−	+ + + +
8	S.Y.	31	M	1	6 wk.	20/25	+0.75	100	Double irreg.	Pos. rel.	Ser. detach.	+	+	−	+ + + +
9	T.K.	51	M	1	10 wk.	20/70	+1.5	93	Double arc	Pos. rel.	Ser. detach.	+	−	−	+ + + +
10	H.T.	39	M	2	7 mo.	20/25	+0.25	93	Double irreg.	Pos. rel.	Ser. detach.	+	−	−	Unknown
11	E.M.	31	F	1	3 wk.	20/25	+1.25	93	None	Pos. rel.*	Ser. detach.	+	−	−	+
12	K.F.	31	M	2	5 mo.	20/200	+2.5	83	Double irreg.	Pos. rel.	Serofib. detach.	−	−	−	+ + + +
13	Y.N.	31	M	3	6 da.	20/30	+0.5	87	Double irreg.	Pos. rel.	Ser. detach.	+	+	−	+ + + +
14	S.T.	34	F	3	1 da.	20/15	0.0	95	None	Pos. rel.*	Ser. detach.	+	+	−	+
15	A.O.	42	F	1	2 mo.	20/25	+0.25	90	Single irreg.	Pos. rel.	Ser. detach.	+	−	−	+
16	F.N.	37	F	2	3 mo.	20/70	+0.25	90	Double irreg.	Pos. rel.	Ser. detach.	+	−	−	+
17	H.I.	47	F	1	3 wk.	20/20	+0.5	97	Single arc	Pos. rel.	Ser. detach.	+	+	−	+
18	K.S.	55	M	1	1 mo.	20/70	+1.0	93	Single irreg.	Pos. rel.	Serofib. detach.	−	+	−	+
19	K.Y.	33	M	1	1 mo.	20/25	+1.0	83	Double concave	Pos. abs.	Almost normal	−	−	−	+ + + +
20	N.T.	38	F	2	1 mo.	20/40	+1.0	83	Double irreg.	Pos. rel.	Serofib. detach.	−	−	−	+ + + +
21	M.H.	37	F	1	4 da.	20/30	+1.5	93	Single concave	Pos. rel.	Ret. edema	−	−	−	+
22	K.S.	34	M	2	4 mo.	20/25	+0.25	93	Double concave	Pos. rel.	Serofib. detach.	−	−	−	+
23	S.M.	24	F	2	5 da.	20/70	0.0	93	Single irreg.	Pos. rel.	Ret. edema	−	−	−	+ +
24	K.T.	48	F	1	10 da.	20/100	+2.5	80	Double irreg.	Pos. rel.	Ser. detach.	+	−	−	+ + + +
25	S.I.	47	M	1	10 da.	20/30	+0.5	100	None	Pos. rel.	Ser. detach.	+	−	−	+ + + +
26	K.O.	39	M	1	3 wk.	20/50	+0.25	100	Single arc	Pos. rel.	Preretinal exud.	−	−	−	+ + + +
27	T.M.	28	F	1	4 mo.	20/20	0.0	100	None	Pos. rel.	Almost normal	−	+	−	+ + + +
28	A.K.	40	M	1	3 mo.	20/20	−0.5	100	Double concave	Pos. rel.	Irreg.	−	−	−	+ +
29	M.K.	45	M	5	3 wk.	20/40	−0.25	100	Double irreg.	Pos. rel.	Irreg.	−	−	−	Unknown
30	K.F.	27	M	1	1 da.	20/40	+0.5	93	Single irreg.	Pos. rel.	Serofib. detach.	−	−	−	+
31	S.T.	37	M	2	6 wk.	20/30	0.0	83	Double concave	Pos. rel.	Almost normal	−	−	−	Unknown
32	K.E.	29	F	1	2 mo.	20/30	+0.25	93	None	None	Ser. detach.	+	−	−	+ + +
33	S.H.	27	F	2	6 mo.	20/20	+0.5	93	Double irreg.	Pos. rel.	Serofib. detach.	−	−	−	+
34	S.F.	40	M	1	4 da.	20/15	−0.25	97	Single irreg.	Pos. abs.	Ret. edema	−	−	−	+ +
35	S.K.	41	M	1	2 wk.	20/20	+0.5	93	Single irreg.	Pos. rel.	Ser. detach.	+	−	−	−
36	Y.I.	51	M	1	11 mo.	20/30	−0.25	93	Double irreg.	Pos. rel.*	Almost normal	−	+	−	+ + +
37	K.U.	28	M	1	4 da.	20/50	+0.5	90	None	Pos. abs.	Serofib. detach.	−	−	−	−
38	T.S.	27	F	1	1 mo.	20/50	+0.5	86	Double concave	Pos. rel.	Almost normal	−	−	+ + +	−
39	T.N.	33	M	1	1 wk.	20/30	+0.25	93	Single concave	Pos. rel.*	Serofib. detach.	−	−	−	+ +
40	S.M.	38	M	1	1 mo.	20/40	+0.25	90	Double irreg.	Pos. rel.	Serofib. detach.	−	+	−	+ + +
41	Y.I.	55	M	1	6 mo.	20/40	+1.25	87	Double irreg.	Pos. rel.	Ret. edema	−	−	+	−
42	K.Y.	32	M	1	2 da.	20/20	+0.5	97	Double irreg.	Pos. rel.	Ret. edema	−	−	−	+ +
43	M.H.	47	M	1	3 wk.	20/40	+0.75	97	None	Pos. rel.	Ser. detach.	+	−	−	−
44	A.K.	36	M	5	2 wk.	20/40	+0.75	93	Double irreg.	Pos. rel.	Serofib. detach.	−	−	−	+
45	T.N.	32	M	1	3 mo.	20/20	0.0	93	Double irreg.	Pos. rel.	Ser. detach.	+	+	−	+
46	T.O.	37	M	1	10 da.	20/30	+0.75	87	Double concave	Pos. rel.	Ser. detach.	−	−	−	+
47	M.S.	34	M	1	6 wk.	20/20	+0.5	87	Single arc	Pos. rel.	Serofib. detach.	−	+	−	+
48	K.Y.	65	M	1	6 wk.	20/200	0.0	74	Unknown	Pos. rel.	Ser. detach.	+	−	−	+
49	T.H.	41	M	R1	5 wk.	20/40	Unknown	Unknown	Single concave	Pos. rel.	Ser. detach.	+	−	−	+
				L3	5 da.	20/50	Unknown	Unknown	Double concave	Pos. rel.	Ser. detach.	+	−	−	+
50	S.U.	34	M	1	6 wk.	20/40	−0.5	90	Double concave	Pos. rel.	Almost normal	−	−	−	+
51	A.N.	38	M	1	2 wk.	20/100	+0.75	87	Double arc	Pos. abs.	Ser. detach.	+	−	+ +	+

* Yellow.

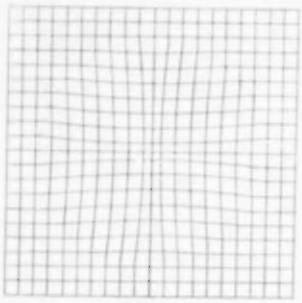

Fig. 1

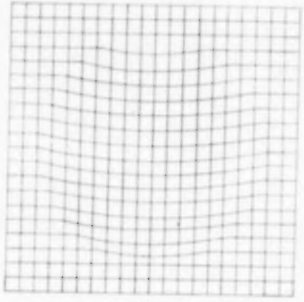

Fig. 2

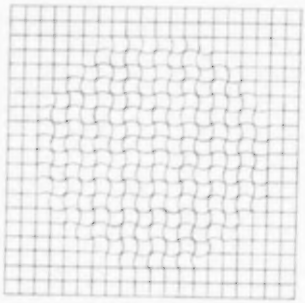

Fig. 3

Figs. 1, 2, and 3 (Mitsui-Sakanashi). (Fig. 1) Double concave form of metamorphopsia. (Fig. 2) Single arc form of metamorphopsia. (Fig. 3) Double irregular form of metamorphopsia.

peropia was thus demonstrated in 34 of the 51 cases. The degree of hyperopia was less than +2.5 diopters and the average degree was +0.9 diopters. Detailed data are tabulated in Table 1.

Course and relapse

The condition is of a benign nature and is somewhat self-limited. A quiescent stage can be reached under therapy. The time from the onset to the quiescent stage was one to 10 months in our series; average, three months. Good vision would then be restored. However, a relapse is not uncommon. Among 51 cases of our series, the present attack was the first attack in 38 cases, the second attack in eight cases, the third attack in three cases, and, in the last two cases, it was the fifth attack.

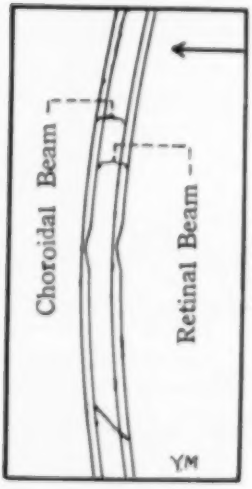

Fig. 4 (Mitsui-Sakanashi). Slitlamp section of normal macula. Arrow indicates the direction of the light projection.

Slitlamp fundus findings

In the normal macula (fig. 4), the section of the retinal surface by the slitlamp, the retinal beam (RB) looks like a gentle arc bending toward the opposite to the light projection. The fovea appears as a slight excavation. The section of the pigment epithelium, the choroidal beam according to our nomenclature (ChB), lies behind the retinal beam. The retinal beam is transparent and, at the portion not covering the choroidal beam, it looks pale. The choroidal beam at the portion not covered by the retinal beam looks brown and not transparent. This finding can only be recognized with an extremely narrow slit and a good focusing of the slit on the retina. The retinal blood vessel casts a shadow on the choroidal beam but, in the normal retina, the vessel and the shadow rarely appear as two separated lines.

The slitlamp finding of central angiospastic retinopathy falls into three categories:

1. Circumscribed serous detachment of the retina (fig. 5)

This type was seen in 22 of the 51 cases. In this type, the retinal beam bends forward by slitlamp observation. There is a detached space (DS) between the retinal beam and the choroidal beam. By a narrow-slit observation

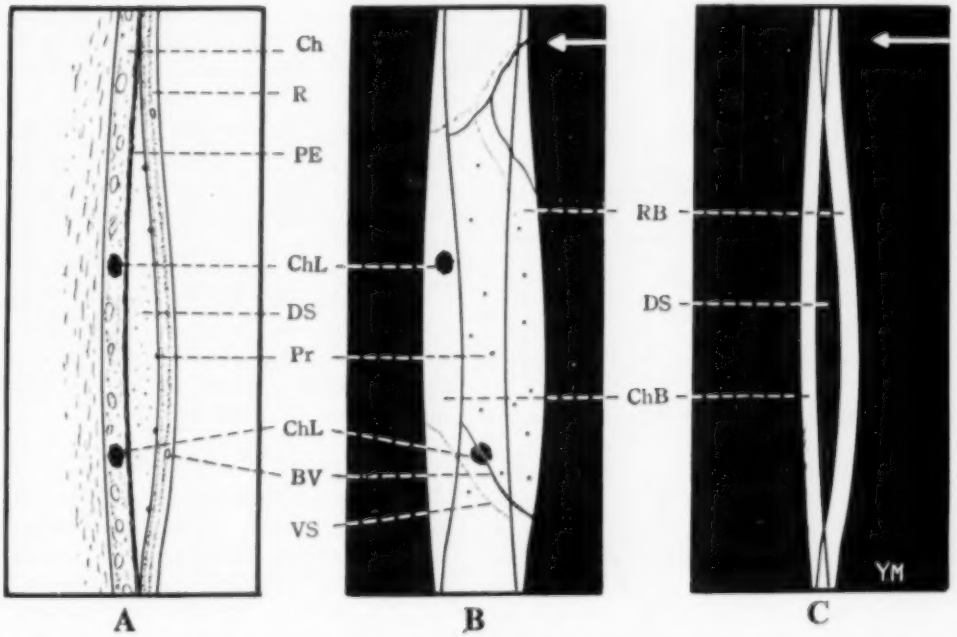

Fig. 5 (Mitsui-Sakanashi). Slitlamp section of serous detachment type. (A) Anatomic section, an imaginary illustration. (B) Usual slitlamp section. (C) Narrow-slit section. (BV) Blood vessel. (Ch) Choroid. (ChB) Choroidal beam. (ChL) Choroidal lesion. (DS) Detached space. (PE) Pigment epithelium. (Pr) Precipitate. (R) Retina. (RB) Retinal beam. (VS) Vessel shadow. Arrow indicates the direction of the light projection.

(fig. 5C), the detached space may appear covered neither by the retinal nor by the choroidal beam. Then the space looks pitch black. The retinal beam can appear by itself at the ceiling of the dome and, at this portion, it looks like a pale and transparent band.

The blood vessels appear in the retinal beam and cast a shadow on the choroidal beam. The vessel and the shadow appear as two separate lines, when the vessel does not run in the horizontal direction, Minute white spots, which appear several weeks after the onset of the disease, are seen in the retinal beam and behind the vessels. Yellow spots of various sizes are seen through the pigment epithelium deep in the choroidal beam. The white spots may be the precipitates (Pr) on the posterior surface of the detached retina and the yellow spots may be the primary lesions of this affection in the choroid (ChL), as already rightly suggested by Masuda and others.

The detachment is dome-shaped at the beginning. In the convalescent stage, however, the exudate at the middle of the detachment is sometimes absorbed, giving a doughnut-shaped detachment (fig. 6). The same thing is observable in the serofibrinous type of detachment. The doughnut detachment in the convalescent stage was observed in 10 of the 33 cases of serous and serofibrinous detachment types. In one other case, the doughnut detachment was observed at the earliest stage of the disease, four days after the onset of the attack.

2. Circumscribed serofibrinous detachment of the retina (fig. 7)

This type was seen in 11 of the 51 cases. The slitlamp findings in this type are much the same as those of the serous detachment,

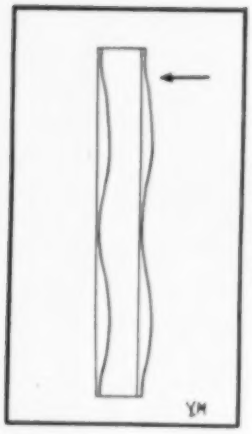

Fig. 6 (Mitsui-Sakanashi). Doughnut detachment in convalescent stage. Arrow indicates the direction of the light projection.

the differences being: (a) The detached space as seen by the narrow slit observation does not look pitch black but looks more or less opaque; (b) the vessel shadow on the choroidal beam is faint or not observable; (c) the choroidal beam looks dull and not sharply defined; (d) the precipitates on the posterior surface of the retina can be seen clearly, whereas, the choroidal lesion looks blurred. These differences may be due to an increased opacity of the exudate in the detached space. There is no change in the retinal beam, and the precipitate on the posterior surface of the retina can be clearly seen. Therefore, the retina itself must be transparent.

A sharp line cannot be drawn, of course, between the serous and the serofibrinous types and there are transition forms. Both types are interchangeable during the course of the disease. Our statistics are based on the findings at the first examination.

3. Circumscribed retinal edema (fig. 8)

This type was observed in seven of the 51 cases. In this type, the retinal beam does not bend forward by slitlamp at the beginning of the disease, as seen in the upper half of Figure 8. On the contrary, the choroidal beam looks as if it bent forward. Thus the

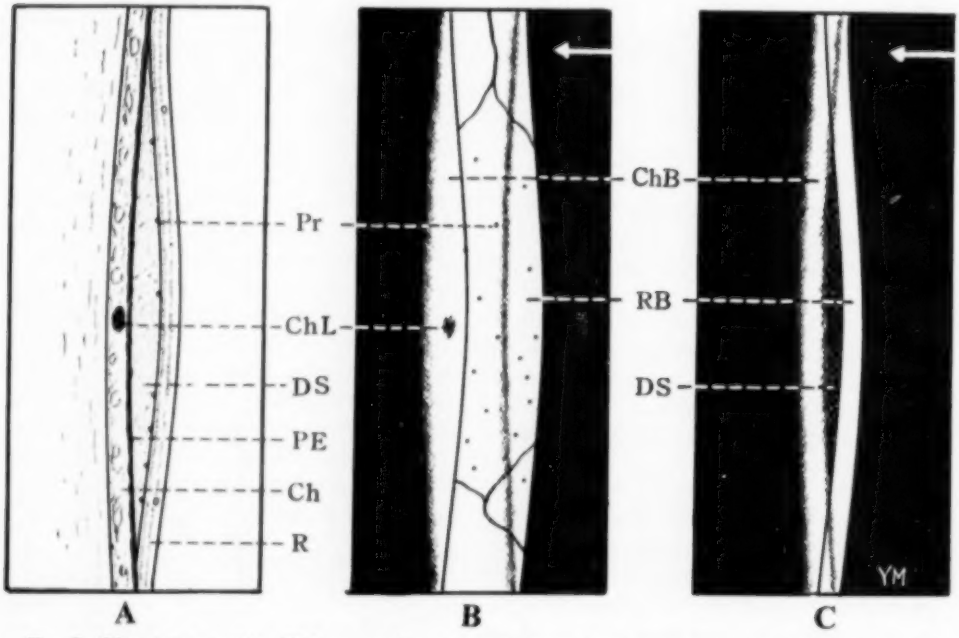

Fig. 7 (Mitsui-Sakanashi). Slitlamp section of serofibrinous detachment type. (A) Anatomic section, an imaginary illustration. (B) Usual slitlamp section. (C) Narrow-slit section. Arrow indicates the direction of the light projection. For other abbreviations see Figure 5.

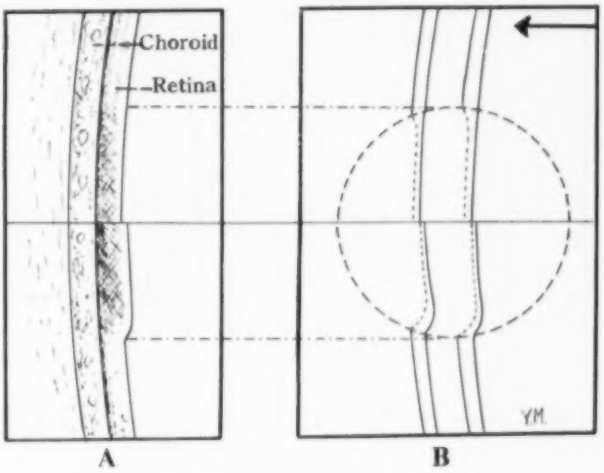

Fig. 8 (Mitsui-Sakanashi). Slitlamp section of edema type. (A) Anatomic section, an imaginary illustration. (B) Slitlamp section. The upper half shows an edema without swelling in the early stage. The lower half shows an edema with swelling in the advanced stage. Arrow indicates the direction of the light projection.

transparent retina becomes thin. However, the choroidal beam itself does not actually bend forward but there is a cloudiness in the deeper layers of the retina, as seen in cases of Berlin's edema, and thus the choroidal beam is covered and hidden. This can be presumed by the fact that the retinal beam does not bend forward at the beginning and that the transparent layer of the retina becomes thin.

With time, however, the retinal beam is likely to bend forward to some extent, as illustrated in the lower half of Figure 8. This may be due to an edematous swelling of the deeper layers of the retina and not to a detachment because, in case of retinal detachment, the retinal beam bends forward in dome or mound form, whereas, in a case of retinal edema, it bends forward in roof or square-bracket form. In the type with retinal edema, neither a detachment space nor a vessel shadow can be observed through the whole course. The retinal deposits also do not occur.

In the retinal edema type, the choroidal lesion cannot be seen until the retinal turbidity disappears. In the convalescent stage, however, distinct and large lesions, as seen in the lower half of Figure 9, become observable when the retina clears.

A hyperopia in comparison with the second eye is common in the detachment type but it is less frequently met with in the edema type. The incidence was as follows:

	Detachment	Edema
Relative hyperopia	28	3
Relative emmetropia	4	2
Relative myopia	0	2
Unknown	1*	0

* Unknown due to a bilateral affection.

By ordinary ophthalmoscope, the lesion of a retinal detachment in either the serous or serofibrinous types is not clearly seen. There is no obvious difference in the color between the detached and nondetached portion of the retina. The border of the detachment is often hardly recognizable particularly in the upper quadrants. In the lower quadrants, however, particularly in cases with abundant exudate, a sharp line is often observable and the lesion looks a little darker though more transparent than the normal fundus. The serous and the serofibrinous types cannot be differentiated with certainty by an ordinary ophthalmoscope.

In the retinal edema type, an ordinary ophthalmoscope reveals an impressive finding. The lesion is sharply defined and looks opaque. In case of slight edema, the lesion looks dull orange and, in case of intensive edema, it looks grayish-white.

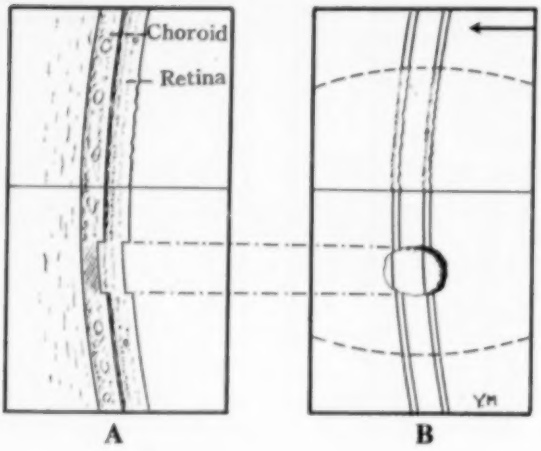

Fig. 9 (Mitsui-Sakanashi). The upper half shows an irregular form. The lower half shows a scarring of the choroidal lesion. (A) Anatomic section, an imaginary illustration. (B) Slitlamp section. Arrow indicates the direction of the light projection.

4. Other types

Besides the three types already described, we observed three cases of this condition in which an irregularity of the retinal beam was the only finding by slitlamp (fig. 9, upper half). It is not certain whether this would be an independent type of the condition or merely is one stage of the other types. In seven other cases, the slitlamp observation revealed only a slight roughness in the pigment epithelium of the macular region. These cases were supposed to have already reached the quiescent stage. In one other case, we found a preretinal exudate. It is not sure whether this case should belong to the condition under discussion or not. Maumenee[7] informs us that he saw a case in which the choroidal beam itself bent forward. However, we have not yet found this form.

Masuda, Hasegawa, and Kitahara classified the clinical findings of this condition by ophthalmoscopic examination into two types: (1) The serous-detachment and the exudative-detachment types. The former is a lesion without turbidity and the latter with turbidity. They consider that the turbidity is due to an increased opacity of the subretinal exudate. Our slitlamp observations revealed, however, that the serous-detachment type found by Masuda and others should actually be the detachment type but the exudative type as described by them does not consist in actual detachment but is a type of retinal edema without detachment. The turbidity is due to an increased opacity of the deeper layers of the retina itself. Our observations further reveal that the actual detachment type can further be subdivided by slitlamp examination into serous and serofibrinous forms.

Choroidal lesions

The choroidal lesions can be observed as yellow spots through the pigment epithelium in the choroidal beam. After cure, there remain a slight depigmentation and roughness of the choroid and pigment epithelium. However, in cases with larger lesions, scarring and excavation may result, as illustrated in the lower half of figure 9. We have observed such scarring in four of our cases—all were seen exclusively in the edema type. This fact may indicate that, if the primary lesion in the choroid is large, an edema type of lesion is likely to result, while with smaller primary lesions, a detachment type is more likely to occur.

Etiology

It is not the purpose of this paper to discuss the etiology of this condition, as our

study was not focused to this. Nevertheless, we should like to discuss this point briefly.

Some investigators, as cited by Buxeda,[5] consider this condition to be due to angiospasm of the capillaries at the macular region. Thus the term "central angiospastic retinopathy" is now being employed. However, so far as our own cases are concerned, the condition does not seem to have angiospasm as the etiologic factor. The causes are:

1. In any retinal condition, a subretinal exudation and, therefore, an exudative detachment of the retina, are not likely to occur. It is well known that a hemorrhage from the retinal vessels usually does not drain into the subretinal space but is more likely to drain into the preretinal or subhyaloid space. A subretinal exudation seems to suggest the presence of the primary lesion in the choroid.

2. We have observed some cases of actual angiospasm of the retina. In these cases, the cloudiness of the retina, if present, occurred in the inner layers of the retina as in arterial obliteration of the retina. The cloudiness does not last for more than three weeks. In the central angiospastic retinopathy, however, the cloudiness of the retina, if present, appears exclusively in the outer layers of the retina as in Berlin's edema. It may last for several months.

3. As far as our cases are concerned, a circulatory instability of the system, as described in some of the literature, was not demonstrated.

4. In retinal angiospasm, choroidal lesions cannot be found, while in central angiospastic retinopathy they are usually found. Scarring and formation of a depressed area may result. Such lesions cannot be secondary to retinal angiospasm.

Masuda, Hasegawa, and Kitahara unanimously consider the condition to be tuberculous, and the small yellow spots in the choroid, considered to be the primary lesions, to be minute infiltrations or tubercles.

The tuberculin reaction was highly positive in the majority of our cases. We had some cases in which a subcutaneous injection of tuberculin caused a flare-up of the ocular lesion. We have also seen one case in which the patient died of cerebral tuberculosis (operated upon and confirmed by histology) one year after the attack of the retinopathy. Masuda's opinion of a tuberculous nature seems to be grounded in fact. Of course the final conclusions will be drawn by a necropsy in the future. It is regrettable that the eyeball of the patient who died from tuberculosis could not be obtained for histologic study.

Summary and Conclusions

This is a slitlamp study of 51 cases of the so-called central angiospastic retinopathy. The clinical entity of this condition is briefly described. By slitlamp observation, the fundus findings are divided into the detachment type and edema type. The detachment type is further subdivided into the serous and serofibrinous types.

Angiospasm as an etiologic factor seems to rest on meager proofs. An allergic etiology, probably due to tuberculosis or similar affection is more to be suspected. Central serous chorioretinitis, as termed by Masuda, seems a better term than central angiospastic retinopathy.

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Ophthalmic Miniature

How keen was the vision of Sir Launfal?

By Ogden Nash

Man's earlist pastime, I suppose,
Was to play with his fingers and his toes.
Then later, wearying of himself,
He devised the monster and the elf,
Enlivening his existence drab
With Blunderbore and Puck and Mab.
A modern man, in modern Maryland,
I boast my private gate to fairyland,
My kaleidoscope, my cornucopia,
My own philosopher's stone, myopia.
Except when rationalized by lenses,
My world is not what other men's is;
Unless I have my glasses on,
The postman is a leprechaun,
I can wish on either of two new moons,
Billboards are graven with mystic runes,
Shirts hung to dry are ragtag gypsies,
Mud puddles loom like Mississippies,
And billiard balls resemble plums,
And street lamps are chrysanthemums.
If my vision were twenty-twenty,
I should miss miracles a-plenty.

NOTES, CASES, INSTRUMENTS

TREATMENT OF A TRAUMATIC IMPLANTATION CYST OF THE IRIS*

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Huntington, West Virginia

The occurrence of a large iris cyst following cataract surgery is not too uncommon and yet, when one is confronted with this situation, a search of the literature on the management of such a condition reveals a diversity of opinion on the subject. Hulke (1869) first discussed and classified iris cysts and, following this, many authors have attempted to classify this condition further. A generalized division has been made by Duke-Elder but it is agreed that this classification is not too satisfactory; however, the condition to be discussed may be found in Duke-Elder under traumatic implantation iris cyst (or immigration cyst of Zeeman).

This type of iris cyst has been produced experimentally in animals by the introduction of foreign bodies (hair, conjunctiva, and so forth) into the anterior chamber. It also occurs as an epithelial downgrowth along surgical or traumatic wounds of the cornea or limbus onto the iris and has so been reported following various types of intraocular surgery, especially cataract surgery.

The walls of these cysts are relatively thin. They are produced either by separation of the iris pigment layers or the anterior stroma from the pigment layers at the periphery or by an epithelial downgrowth over the anterior stroma of the iris. (Zeeman in Berens *Diseases of the Eye* calls this latter type of iris cyst an immigration cyst.) The fluid contained in the cyst is usually yellowish in color and, on one occasion, a fluid level was definitely recognized (v. Hippel, 1913) and reported.

In the differential diagnosis, a malignant melanoma may at times be suspected but the thin walls of the cyst, its easy transillumination, and a history of surgical or accidental trauma help verify the diagnosis. A spontaneous cyst may also be confusing, as has been pointed out by Duke-Elder. He states that a small injury may be forgotten and missed but the finding of a foreign body in the eye confirmed the diagnosis.

TREATMENT

There is great diversity of opinion on an acceptable method of treatment for implantation or immigration cysts.

Zeeman feels that small cysts should not be treated, that larger ones should be excised by iridectomy and possibly repaired with a conjunctival flap. He also claimed that drainage of the cyst with some tearing of the wall gave a satisfactory result in one case and that X-ray treatment could be tried but the value of this treatment was questionable.

Spaeth mentions the use of a 50-percent dextrose solution and that Vail used a one-percent solution of tincture of iodine as a sclerosing solution. Spaeth believes that prevention of a cyst is possible by careful and adequate toilet of operative wounds; cilia must be removed from the anterior chamber even if an iridectomy becomes necessary. He notes that an iridectomy to remove a well-formed iris cyst may be attempted but that, generally, this is a difficult and not too satisfactory procedure.

Duke-Elder mentions that an iridectomy may be successful if the cyst is small and can be completely included in the iridectomy. If the cyst is larger, an iridectomy can be combined with X-ray therapy. Aspirating the cyst and injecting its cavity with ether, iodine, or carbolic acid has been attempted as

* Presented at the meeting of the West Virginia and Virginia Academies of Ophthalmology and Otolaryngology at the Homestead, Hot Springs, Virginia, May, 1953.

has been puncturing the cyst with diathermy.

Vail reviews this condition in full and suggests diathermy as a method of treatment.

Case report

Mr. I. M. O., aged 78 years, was first seen on November 11, 1952. He gave a history of having had cataract surgery to both eyes by two different surgeons in another city several years ago. He had had some difficulty with his right eye since surgery (two years earlier) and his vision was becoming dim and he could not see as well out of the right eye. On some occasions he had some pain in the right eye.

Examination of the left eye showed a typical, round-pupil, aphakic eye with the peripheral iridotomy. The right eye showed a complete iridectomy with typical coloboma formation but the nasal pillar of the iris was replaced by a large iris cyst which involved the entire nasal pillar from the 5-o'clock to the 12-o'clock positions. The cyst was large and in the anterior-chamber angle. By slit-lamp examination, it abutted against the posterior corneal surface from the limbus for approximately five mm. and was largest inferiorly. It continued along the entire course of the iris up into the 12-o'clock position. The area transilluminated well but no level of fluid could be ascertained. Intraocular pressure (Schiøtz) was 16.9 mm. Hg.

After being advised that the cyst should be reduced in size or removed, the patient consented to an attempt to aspirate the cyst first and, if this failed, to surgical extraction of the cystic mass. He was admitted to St. Mary's Hospital on March 19, 1953.

The eye was anesthetized in the usual manner, using a Van Lint and O'Brien lid block and a retrobulbar block with Alidase. Two Luer-lok (two cc.) syringes were fitted with No. 26 BD small needles and an ampule of the dextrose solution was sterilized and placed on the Mayo tray. A two-percent novocaine block was placed at the 6-o'clock and 3-o'clock positions, subconjunctivally (for fixation forceps, if necessary). The eye was grasped by forceps at the 9-o'clock position and the needle of the empty syringe was slowly inserted under the conjunctiva, nasally at the 3-o'clock position near the limbus, and a balloon of air was placed in the subconjunctival space to separate it from the episcleral tissues and the limbus. Then the needle was slowly pushed through the limbus area of the cornea into the cystic mass in the anterior chamber. As the light shone on the needle through the transparent layer of iris which formed the outer coating of the cyst, it could be seen penetrating the cystic mass. Slowly about three mm. of turbid, yellowish fluid were aspirated. This syringe was then disengaged from the needle and exchanged for another. After several attempts to aspirate thoroughly all the fluid in the sac, the Luer-lok tuberculin syringe with one cc. of 50-percent dextrose in water (Abbott) was attached to the needle already in position and, slowly, approximately four to five mm. of the solution were washed back and forth through the syringe until the hypertonic dextrose solution began to show a yellowish, darkish tinge. After the solution had been washed into the cyst four or five times, it was aspirated back until the cyst was thoroughly deflated. The needle was then quickly withdrawn. Atropine sulfate (one-percent solution) and terramycin ophthalmic ointment were placed in the eye and the eye was patched.

The immediate postoperative course was quiet and the patient had no undue pain or symptoms. On the following day, at dressing, the eye was found to be injected but the cyst was flat. Cortisone ophthalmic ointment was used with atropine sulfate (one-percent ointment) at each dressing. On the third postoperative day the eye was mildly injected but the cyst was still flat. Intraocular pressure was normal. The eye remained mildly red and injected for 14 days and then became quiet and white. The patient made an uneventful recovery. He has been seen at regular intervals and there has been no recurrence of the iris cyst and the vision, with cataract

lens, has remained as 20/30 + 2 and J2 in this eye.

Comment

When it was decided to use the least radical procedure first, 50-percent dextrose solution was chosen. In view of the successful result, it is felt that this procedure should be tried before more radical therapy is instituted.

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MORE ABOUT RETROLENTAL FIBROPLASIA

John F. Mungovan

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Boston, Massachusetts

The Children's Staff of the Division of the Blind from time to time reviews the capabilities and achievements of the preschool children known to the division for the purpose of planning future work. It is important to know for planning purposes how many children will be ready for school in successive years. It is customary, therefore, to examine the knowledge the workers have of the children at the end of the state fiscal year on June 30th.

On June 30, 1954, such an examination revealed that there were 268 children in what is termed the preschool group known to the division (table 1). At that time a preschool child would be one born in 1948 or later. Since retrolental fibroplasia is such an important cause of blindness the children were counted in two groups, those diagnosed as having retrolental fibroplasia and all others. Thus in the retrolental fibroplasia group there were 186 of the 268 preschool children, and 82 in the "all other" group. It

TABLE 1

Study of 268 preschool blind children

(June, 1954, born 1948 and later)

	Total		Retrolental Fibroplasia		Optic Atrophy		Other	
	No.	%	No.	%	No.	%	No.	%
Retarded	71	26.5	35	18.8	16	55.1	20	37.7
Average	106	39.6	83	44.4	8	27.6	15	28.3
Superior	48	17.9	41	22.1	1	3.5	6	11.3
Disturbed	17	6.3	11	6.0	3	10.3	3	5.7
Not Known	26	9.7	16	8.7	1	3.5	9	17.0
Total	268	100.0	186	100.0	29	100.0	53	100.0

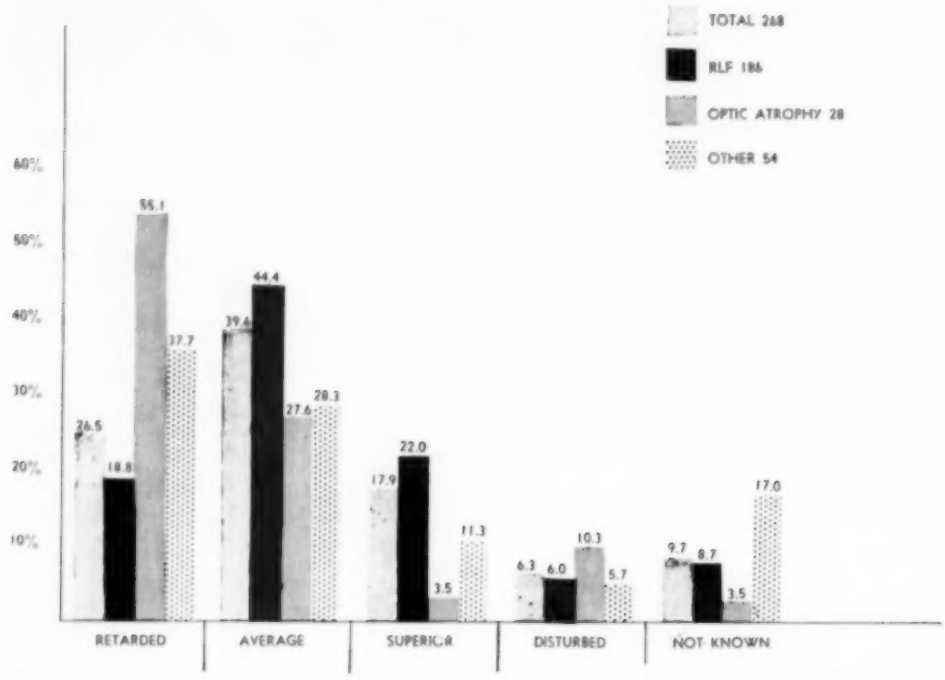

Fig. 1. (Massachusetts Division of the Blind). Estimated capabilities of blind children, born 1948 and later, on the register of the Massachusetts Division of the Blind on June 30, 1954.

can be seen then that more than two thirds (69.4 per cent) were children with retrolental fibroplasia.

For the purpose of estimating how many children might be ready for school in the next two years, from the records available and from the impression of the workers who had seen the children, estimates of their capabilities were made. No scientific rating scale was applied in formulating these estimates. The worker's impression of a child was compared to that of all other children she had known. In many of the cases, the estimates were confirmed by psychologic evaluations but, in others, the worker's uncorroborated judgment was the basis for the rating, although in all cases several workers pooled their impressions.

This study, if it can be dignified with the title of a study, brought about some interesting revelations (fig. 1). The children were classified into three groups: Below average, average, above average. Twenty-six of the children including 16 with retrolental fibroplasia were not known well enough to classify even in this simple way. In the average and better than average groups there were 154 children, 124 of whom, or 80 percent, were in the retrolental fibroplasia group. Of the 88 children considered below average and having adjustment problems, 46 had had retrolental fibroplasia and 42 all others—about a 50-50 division.

While this examination is not validated by approved research methodology, it certainly seems to indicate that more children with retrolental fibroplasia are in the average or above average group than are those with all other eye troubles, and proportionately less are in the retarded or disturbed group than are children with all other causes of blindness.

A CASE FOR DRESSINGS AND EXAMINING EQUIPMENT

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Many of us who do ophthalmic surgery in one or more general hospitals have been confronted with not having dressing material for postoperative care and examination immediately available. Frequently after a wait of from five to 15 minutes for a dressing tray to be brought from central supply it is discovered that certain needed articles have been used or borrowed. In order to have items that I considered necessary, it seemed advisable to supply them myself. Their transportation then became the main problem.

I tried metal and leather boxes but they proved unsatisfactory. Finally the case illustrated in Figure 1 was adapted for these supplies. Originally it was made for a fishing box and is molded of a marbled hard brown plastic which is durable yet light in weight. It is 14.5-inches long, 6.5-inches deep, and 5.5-inches wide. The hinges and fasteners are rustless.

Its handle is adequate in size and conveniently grooved on its under surface. The placement of the handle on the top is such that when the case is closed the contents remain unmoved while being carried. The edge of the top portion is grooved and the edge of the lower portion is tongued, making a weatherproof closure.

The base portion has two partitions which fit into recesses in the bottom of a pliable plastice ice cube tray and accurately support it. The tray compartments are used to hold drop dispensers and ointment tubes. Behind the tray, plastic lure boxes stand on end and contain small examining equipment, such as an ophthalmoscope head. Beneath the tray in the bottom compartments I have sterile dressing supplies and larger examining equipment.

When in use the case opens widely and the tray may be lifted from the carrying position and placed in the top.

I have used this particular dressing case for less than one year but have found it very satisfactory for my needs. It is light in weight, odorless, of adequate size, durable, easily cleaned, weatherproof, and neat in appearance.

700 South McCullough.

Fig. 1 (Nisbet). Case for dressings and examining equipment.

A SIMPLE FIXATION LIGHT*

FOR THE CARDINAL DIRECTIONS OF GAZE

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During the objective examination of the ocular muscle balance, the measurement of the angle of deviation in the six cardinal directions of gaze is of great diagnostic importance in the analysis of vertical anomalies. The screen cover test is the best objective method of making these measurements because it gives the most exact revelation of ocular muscle function. However, the test is awkward and unwieldy because the examiner needs one hand for the prisms and one for the screen. Either the patient or an assistant must hold the fixation light. Furthermore, in the two downward cardinal positions, it is difficult to see the corneal

* Manufactured by The Head Line Co., Flushing 66, New York.

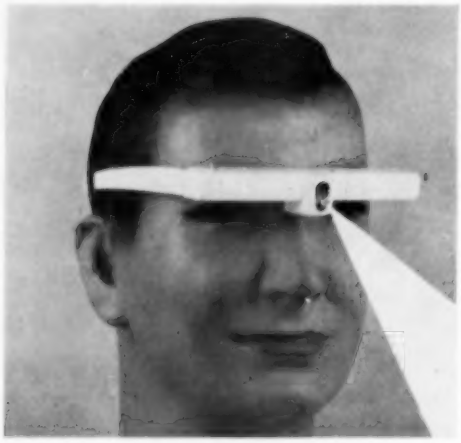

Fig. 1 (Rubin). Fixation light.

reflexes and eye movements unless the upper lids are elevated by an assistant or by the hand burdened with the prisms.

To overcome some of these difficulties, many ingenious instruments of varying complexity and cost have been devised. However, a simple solution to the awkwardness of the test consists of a small fixation light worn on the examiner's forehead. This eliminates the need for an assistant.

In the screen cover test, the closer the axis of observation of the examiner is to the axis of fixation of the patient, the easier and more accurate is the measurement. This is in contradistinction to the screen comitance test where the axis of observation must be different from the axis of fixation.

When the patient fixes the light on the examiner's forehead, the examiner is looking along an almost identical axis toward the patient's cornea. The head of the patient is stationary, and the examiner's head is moved into each of the six cardinal positions. Thus, even in the two downward cardinal positions, the corneal reflexes and movements are visible without elevation of the upper lids, because of the close approximation of the axis of observation to the axis of fixation.

For some years, I have used an ordinary pen flashlight clipped to a headband for the screen cover test. Recently, there has appeared on the market, a small instrument (fig. 1) called the head-penlight* which is even better for the purpose.

The head-penlight consists of a small flashlight in an ingenious plastic case, which can be worn like a pair of glasses. It will also fit above regular glasses with minimal interference. When worn on the head, it has made the screen cover test in the six cardinal positions less awkward and easier to perform. It can also be held in the hand like any light when performing the screen comitance test, in which the axis of observation must be different from the axis of fixation.

2014 Tulare Street.

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ACUTE CONCOMITANT SQUINT WITH DIPLOPIA*

Simulating bilateral lateral rectus paresis

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Concomitant squint as commonly seen in young children starts early in life, before full development of binocular vision, and is not accompanied by diplopia except, if at all, in the very initial stages. Squint accompanied with diplopia, of nonparalytic origin, occurring at a later age must necessarily appear after binocular vision has developed and binocular reflexes have become fairly well established so that suppression becomes increasingly difficult. In concomitant squint, diplopia has been described in the following group of cases:

A. Primary concomitant squint with diplopia in (1) myopes and (2) nonmyopes.

B. Secondary concomitant squint with diplopia in (1) cases of paralytic squint, developing characteristics of concomitance and (2) cases of concomitant squint improperly treated by surgery, or surgery and orthoptics combined.

Cases with paralysis of one or both lateral rectus muscles in which typical symptoms are at first present may gradually change into a concomitant type of deviation as shown by the following case reported by Urist:[1]

> The patient, aged 21 years, when seen in May, 1946, complained of acute onset of double vision and crossing of eyes of four weeks' duration. She had an alternating esotropia of 25 degrees. Homonymous diplopia was present in all fields of gaze. Bilateral weakness in elevating eyes up and in and bilateral limitation of abduction were demonstrable. Four years later her eyes were found to be crossed. Diplopia was present for distance while eyes could be straight for near. There was no diplopia when reading. Homonymous diplopia was present and did not change on gaze to right or left. There was no limitation of lateral rotation.

Urist[1] has cited this case as one simulating divergence paresis. What is of interest at the moment is the absence of limitation of abduction and no change in the diplopia on looking to the right or left—characteristics of concomitance—developing within four years from the time of the initial attack.

Primary concomitant squint with diplopia presents a different clinical picture. Onset is sudden in cases described as acute. Diplopia is of the homonymous type in convergent squints. The angle of deviation and distance between images are constant and do not change on looking to the right or left. There is no limitation of abduction. Recovery in some of these cases has been reported, following use of glasses alone or glasses and prisms together (Bielschowsky), a retrobulbar injection of novocaine (Bailliart), or a tenotomy of internal rectus muscle (Paufique).[2]

The purpose of this communication is to present a case of acute concomitant squint with diplopia simulating bilateral lateral rectus paresis, in a young woman, aged 18 years, who complained of homonymous diplopia present in all positions of gaze, with a fairly large angle of squint—esotropia of 25 to 30 degrees—and of acute onset.

I should also like to draw attention to the presence of evidence of some slight inhibition of both lateral rectus muscles in some cases which would otherwise pass as cases of concomitant squint with diplopia of primary type. Whether such cases should be taken to form a definite clinical entity has yet to be determined because of the small number of cases reported. However, the possibility should be kept in mind for the symptomatology in these cases is definite—presence of binocular and stereoscopic vision with good amplitude of fusion within a certain range on the synoptophore; the condition being relatively more amenable to treatment by measures significantly milder than those required for typical cases of concomitant squint.

* From the Department of Ophthalmology, King George's Medical College, Lucknow.

Case report

A young woman, aged 18 years, presented herself with complaints of diplopia and inward deviation of her left eye. One day while in school, she suddenly began to see double. The attack lasted for about five minutes. That same evening at her home while working in the kitchen she again saw double. Severe headache appeared a little while after the onset of diplopia and persisted for two or three days.

On examination two weeks after onset of the attack the left eye was found to be turned inward. Movements of each eye studied separately were smooth and apparently normal. However, on looking with both eyes open to the left, the left eye failed to reach the outer canthus. The angle of squint was fairly constant in all positions and for all distances. The patient had homonymous diplopia in all positions. The two images were at the same level but the distance between them increased on looking both to the right and left. The increase was more marked on looking to the left, suggesting involvement of both lateral rectus muscles, the left being more affected than the right. On the synoptophore she could maintain fusion between 10- and 40-degrees convergent and within these limits she had good fusion and stereoscopic vision.

She had had an attack of epidemic dropsy about a year before from which she recovered in one and a half months. The disc of the left eye was pale and the field of vision of that eye showed contraction. Wassermann reaction was negative. Nothing abnormal was found on neurologic examination.

The patient's recovery was dramatic. She was given a few orthoptic treatments. Every time during the first treatments she would maintain fusion up to 10 degree of convergence but could not go beyond this point, her eyes failing to diverge further. During the fifth treatment, being determined to get past the obstacle—the position of 10-degrees convergence—she persisted in her attempts a little longer than usual and in the end did succeed for she could maintain fusion up to three to four degrees of divergence. No sooner had she done this than the diplopia disappeared and her eyes became straight and remained straight all the time she was under observation.

Comment

Homonymous diplopia, present in all fields of gaze in myopes as described by Bielschowsky, Weber and Franceschetti,[2] forms a definite clinical entity. In nonmyopes this type of diplopia is due either to insufficiency of both lateral rectus muscles or to breaking down of a pre-existing esophoria into a tropia. The diplopia, in these two groups of cases, differs in that, in cases due to insufficiency of the muscles, the distance between images increases on looking both to the right and left; whereas, when a change over from phoria to tropia occurs, the distance between images remains constant in all positions. In diplopia of divergence paresis also, distance between images will not increase on looking to the right or left.

Meisenbach[3] has described bilateral paralysis of external rectus muscles in a boy, aged five years, with hypertelorism. Most of the cases of external rectus paresis subsequent to the administration of an anesthetic have followed spinal anesthesia but Dattner and Thomas have described one case which followed simple lumbar puncture and Voltman reviewed two cases of palsy subsequent to ether anesthesia.[4]

Cases of isolated abducens nerve paralysis have also been reported after cranial trauma and in association with some lesion of the posterior fossa. Bilateral sixth-nerve paralysis due to traction on the nerve may also occur as a late and remote effect of brain tumor with increased intracranial pressure.

Dr. Robert A. Groff[5] has described a case of bilateral sixth-nerve paralysis with double vision as the only symptom due to a stretch on the nerves caused by a tumor in the inter-

peduncular space. Adler[5] described the case of a child, aged eight years, originally thought to be a case of concomitant squint, though with noticeable limitation of abduction, which turned out to be a case of brain tumor.

Craniopharyngioma, malignant nasopharyngeal neoplasms, and aneurysms of the vertebral artery have been responsible for bilateral lateral rectus paralysis in some cases.

Sudden disappearance of squint and diplopia following a few orthoptic treatments distinguishes the present case from the group of cases just mentioned and suggests as the cause of the condition, temporary inhibition of the two lateral rectus muscles rather than an organic lesion. Increase in the separation of images on looking to either side rules out comitance and divergence paresis.

Points of particular interest in this case are:

1. Sudden appearance of uncrossed diplopia in all positions in an apparently healthy person.
2. Recurrence of symptoms after a few hours, remission of symptoms.
3. No appreciable limitation of abduction but an increase in the distance between the two images on looking to either side.
4. Presence of fusion and stereopsis within a certain range on the synoptophore.
5. Sudden disappearance of diplopia and squint during the course of orthoptic treatment.

Franceschetti[2] has described a few patients under the heading of "Acute concomitant squint with diplopia," most of whom have at some time or other either suffered, or were thought to suffer, from varying degrees of paresis of the lateral rectus muscles. One case from this group was cured after four orthoptic treatments, while the remaining cases required surgical intervention.

Franceschetti reported the case cured by orthoptic treatment as follows:

> A man, aged 47 years, suddenly began to see double. He then had persistent diplopia, headache and vertigo. On examination 10 days later his trouble was thought to be due to slight insufficiency of both lateral rectus muscles. The angle of squint was constant for all distances. Amplitude of fusion was good (10 to 40 degrees convergent). Esotropia seemed to diminish on near vision. Medicinal paralysis of accommodation did not affect the esotropia. The Patellar reflex was found to be unequal during neurologic examination. Definite cure was obtained after four sittings of orthoptic treatments.

The presence of diplopia with increase in separation of images on looking to the right and to the left, without any gross limitation of abduction of either eye in one case and bilateral limitation of abduction in the other case favor the diagnosis of bilateral insufficiency of the lateral rectus muscles and do not fit in with the diagnosis of concomitant squint with diplopia caused by the breaking down of a pre-existing esophoria into a tropia.

A definite cure after a few sittings of orthoptic treatments in both cases and the rather sudden disappearance of symptoms in one case suggest a nonparalytic origin; at least it seems improbable that the condition was due to any organic lesion.

The case herein reported and the one described by Franceschetti are similar. In both diplopia was persistent and headache a marked feature. Both cases showed signs of insufficiency of both lateral rectus muscles and were cured by a few orthoptic treatments. Neurologic examination was negative.

Other cases described by Franceschetti are not so typical but they also present most of the characteristic signs—evidence of involvement of both lateral rectus muscles, presence of binocular vision with good amplitude of fusion on the synoptophore, and cure following relatively mild measures.

Thomas, Grimault, and Brocker[6] describe four traumatic cases (no diagnosis given) in which cure was effected by orthoptics alone. In two other traumatic cases of total third-nerve paralysis, good results followed orthoptic treatment combined with surgical intervention. Orthoptic treatment has proved of no avail in my cases of full-fledged paralysis of the external rectus muscle with deviation and limitation of abduction of the

affected eye. Hartman[6] also finds orthoptic treatment to be of value only in cases of paresis with diplopia but without deviation.

Cases belonging to the group of "acute concomitant squint with diplopia" show some well-marked characteristics not found in other cases of concomitant squint:

Sudden appearance, a fairly well-marked squint, homonymous diplopia present in all positions but easily distinguishable from diplopia of divergence paresis and full-fledged bilateral lateral rectus paralysis, and presence of fusion and stereopsis within a certain range on the synoptophore. Above all these cases show evidence of inhibition of both lateral rectus muscles and are easily amenable to treatment. These cases therefore seem to form a definite clinical entity with characteristic symptoms and should be distinguished from the other group of cases—concomitant squint with diplopia but without any evidence of involvement of the lateral rectus muscles.

10 A, Jagdish Chandra Bose Marg.

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PSEUDOPARALYSIS OF THE MEDIAL RECTUS*

IN POSTOPERATIVE DIVERGENT SQUINT

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When, after a recession-resection operation for a convergent squint, the patient is left with a divergent strabismus and abolition of adduction of the operated eye, the logical explanation seems to be that the medial rectus muscle has slipped due to loosening of the sutures of the retroplacement.

The two cases considered herein show that a false paralysis of the medial rectus muscle can occur due exclusively to the mechanical impossibility of adduction caused by firm resistance of the surgically shortened lateral rectus. In effect, the retroplacement of the previously resected lateral rectus brought about recovery of the lost capacity of adduction.

* From the Department of Ophthalmology, Hospital Salvador.

CASE 1

M. B., aged five years, presented alternating convergent squint from the age of six months (fig. 1). Versions were normal and there was good power of convergence. The degree of strabismus did not change when looking upward or downward:

Synoptophore: Angle { F.R.E.: ÷ 25° L/R 9Δ ; F.L.E.: ÷ 25° Θ }

Abnormal retinal correspondence was not influenced by orthoptic treatment.

On July 25, 1952, the left eye was operated and a five-mm. recession of the medial rectus and an eight-mm. resection of the lateral rectus were done.

As soon as the bandage was removed (10 days after operation) there was marked divergence of the left eye which persisted in spite of a 15-day Blascovicz guiding bandage toward the right.

Five months after operation the divergent squint persisted (fig. 2), with complete paralysis of adduction of the operated eye which could not rotate inward past the midline.

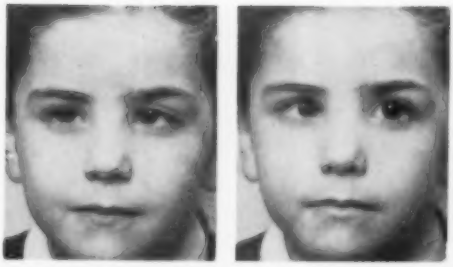

Fig. 1 (Villaseca). *Case 1.* The patient showed alternating convergent strabismus from the age of six months.

Synoptophore: Angle $\begin{cases} \text{F.R.E.: } -12^\circ \text{ L/R } 4\Delta \\ \text{F.L.E.: } -12^\circ \text{ R/L } 5\Delta \end{cases}$

Since the paralysis of the medial rectus had been present from the first dressing, it was attributed to slipping of this muscle. It was decided to try to re-insert the medial rectus muscle to the eyeball.

On January 5, 1953, a second operation was performed on the left eye, also under general anesthesia. The forced duction test was first done by grasping the conjunctiva with forceps at the 3-o'clock position near the limbus. It showed that, with the forceps, it was not possible to adduct the eye past the midline because of strong resistance at the level of the lateral rectus. On the other hand the abduction was accomplished easily.

In view of this it was decided to operate on the lateral rectus muscle which had previously been resected, without touching the medial rectus as was originally intended. After disinsertion of the lateral rectus, it was possible to abduct the eye freely. The lateral rectus was retroplaced six mm.

Fig. 2 (Villaseca). *Case 1.* Postoperative divergent strabismus after a recession-resection operation on the left eye.

Fig. 3 (Villaseca). *Case 1.* (Left) Four months after recession of the previously resected left lateral rectus. (Right) Sixteen months after operation.

The results can be seen in Figures 3 and 4 which show that the divergent squint has disappeared and the capacity of adduction of the left eye has been almost entirely recovered. The near-point of convergence: 7.0 cm. Cover test: negative.

Synoptophore: Angle $\begin{cases} \text{F.R.E.} = 0^\circ \text{ L/R } 12\Delta \\ \text{F.L.E.} = 0^\circ \text{ R/L } 4\Delta \end{cases}$

Four months after reoperation the anomalous retinal correspondence persisted, but a year later there was intermittent fusion; at times the patient could manage to maintain the fused images but at other times suppressed one or the other eye.

Case 2

N. G. presented convergent squint from the age of two years.

At the age of 16 years, a retroplacement of the medial rectus and resection of the lateral rectus were performed on the left eye. The patient stated that, from the time the bandage was removed, there was a frank divergent squint of the operated eye.

When the patient was first seen by me, she was 20 years of age. There was a divergent squint of the left eye (fig. 5) with frank limitation of adduction in that eye. Apparently there was marked paralysis of the

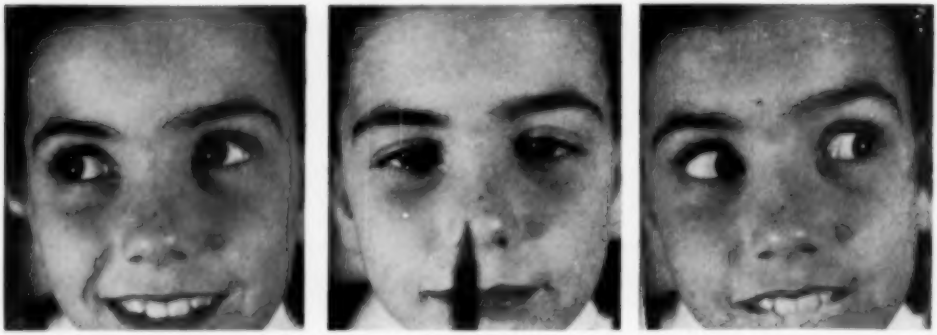

Fig. 4 (Villaseca). *Case 1.* Sixteen months after operation. Note the appreciable recovery of the previously inactive left medial rectus (pseudoparalysis) and the normal action of the resected-recessed left lateral rectus.

left medial rectus, possibly due to loosening of the retroplacement sutures.

Synoptophore: Angle {F.R. and L.E.: — 19° Θ
Vision: R.E. = 20/20; L.E., 20/50

On March 2, 1953, the left eye was re-operated under general anesthesia. At the beginning of operation, the forced duction test with forceps revealed that inward rotation could be accomplished only to about 10 degrees past the midline, there being strong resistance at the level of the lateral rectus. The diagnosis was then made of a pseudoparalysis of the medial rectus due to retraction of the lateral rectus.

The left lateral rectus, which had been resected in the previous operation, was now recessed by seven mm. After this it was possible to adduct the eye normally with the forceps.

As divergence of the eyes persisted, which was considered excessive even for a patient under the effects of general anesthesia, it was decided to inspect the medial rectus which had formerly been retroplaced. It was found inserted in the sclera at 11 mm. from the limbus (that is, retroplaced by six mm.) and free of adhesions to the sclera behind this insertion. After a six-mm. resection, the medial rectus was reinserted in the same position of retroplacement.

The operation resulted in complete disappearance of the divergent squint and recovery of adduction of the left eye. Near-point of convergence: 13 cm. (figs. 6 and 7).

Even though aesthetically the result was very good, the cover test indicates (a year after operation) a convergent squint of about five degrees.

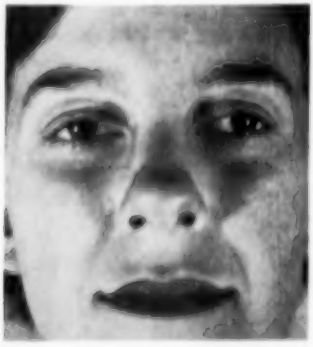

Fig. 5 (Villaseca). *Case 2.* Postoperative divergent strabismus.

Fig. 6 (Villaseca). *Case 2.* (Left) Five months and (right) one year after re-operation.

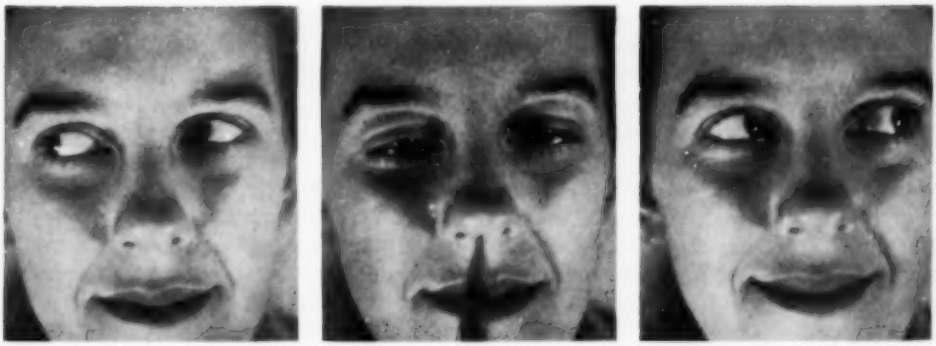

Fig. 7 (Villaseca). *Case 2.* Lateral versions and convergence one year after operation.

Synoptophore: Angle {F.R. and L.E. = +7° θ
Alternate suppression, preferably of the L.E.

Discussion

We have observed, in other patients with partial limitation of adduction after recession-resection operations for convergent squint, a slight narrowing of the palpebral aperture in adduction, that is an outline of the retraction syndrome that Duane described in congenital fibrosis of the lateral rectus. When, after a recession-resection operation, this sign is slightly positive, the limitation of adduction may be attributed to shortening of the lateral rectus and not to weakening of the medial rectus.

The diagnosis may be confirmed, under local or general anesthesia, by means of the forced-duction test. This test was described by Scobee* to study the anatomic factors in the etiology of heterotropias (in cases not yet operated), and he performed it by depressing the lateral or the medial fornices with a muscle hook.

I perform this test by grasping the conjunctiva with forceps near the limbus, at the 9-o'clock position in the right eye and at the 3-o'clock position in the left eye, and carrying the eye first in adduction and then in abduction. The firm resistance at the level of the lateral rectus, which prevents the inward rotation of the eye, assures the diagnosis of retraction of the lateral rectus muscle with pseudoparalysis of the medial rectus.

I have done a retroplacement of a previously resected muscle without difficulty, in several cases and have found it a simple and effective operation.

After incision of the conjunctiva over the muscle, the sclera is bared by blunt dissection away from the scar tissue, that is about four mm. above or below the edge of the muscle. At this point a muscle hook is carefully introduced below the muscle as far as possible behind its insertion, so as to avoid entanglement of the muscle hook in the scar tissue.

The silk or nylon stitches of the previous resection are usually separated and withdrawn; then the retroplacement sutures are passed two or three mm. behind the insertion so that it will not be necessary to cut the muscle too close to the sclera, which might be dangerous in scar tissue. There is usually no difficulty in fixing the muscle to the sclera six or seven mm. posteriorly.

A six- or seven-mm. retroplacement of a previously resected lateral rectus muscle corrects approximately 10 degrees of divergence.

It seems remarkable that, in order to make a strabismus patient orthophoric, it is sometimes necessary to operate twice, undoing at the second operation what was done at the first, without the original condition of convergent squint reappearing. Thus, in Case

* Scobee R. G.: Am. J. Ophth., **31**:781, 1948.

2, the first operation of retroplacement of the medial rectus and resection of the lateral rectus, was completely reversed by resection of the medial rectus and retroplacement of the lateral rectus at the second operation. In spite of this, approximate orthophoria was obtained (fig. 6).

Overcorrections after squint surgery should not, therefore, be feared. Both resection and retroplacement are reversible operations.

SUMMARY

Two patients are reported who, after recession-resection operations for convergent strabismus, remained with a divergent strabismus and abolition of adduction in the operated eye.

The false paralysis of the medial rectus was due to resistance of the resected lateral rectus, as shown by the forced duction test, with forceps, under general anesthesia.

The postoperative divergent strabismus and limitation of adduction were corrected by retroplacing the lateral rectus which had previously been resected.

Marcel Duhaut 2959.

REMOVAL OF AN INTRAOCULAR COPPER FOREIGN BODY

WITH COMPLETE RECOVERY OF VISION

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ROPER O. MCDIARMID, M.D.
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AND
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Edmonton, Alberta

Most copper intraocular foreign bodies result in loss of the eye. Copper is nonmagnetic so that a magnet is of no avail. Extraction is often impossible or may involve a difficult forceps removal which is very damaging to the eye. If the foreign body contains a high percentage of copper and it is not removed, the eye usually degenerates rapidly into a state of phthisis bulbi. If the proportion of copper is low chalcosis commonly occurs.*

When the patient herein reported was first seen, the vision was reduced to hand movements by exudates in the vitreous. These were so dense and the inflammatory reaction so severe that the parents were warned it might become necessary to remove the eye. Fortunately, removal of the copper wire was followed by complete absorption of the exudates and restoration of normal vision. This complete disappearance of extensive inflammatory exudation within the eye without disorganization of the vitreous seems to justify this record.

CASE REPORT

A boy, aged 12 years, was cracking several feet of flexible rubber insulated wire like a stock whip when its frayed end struck his eye. The eye became inflamed and painful. Four weeks passed before it was realized that he had an intraocular foreign body and he was referred for treatment.

When he was first seen, there was much photophobia and the eye was red and painful. Vision was reduced to hand movements. The pupil had already been dilated with atropine. There were no keratic precipitates. The lens was not damaged and no signs of chalcosis could be seen. At the 11-o'clock position, projecting into the vitreous was a conelike mass of solid yellowish-white exudate. The vitreous was hazy and in the region of the 6-o'clock position the exudate was thickened into two dense yellowish-white masses resembling stalactites. The fundus could not be seen. The sense of light projection was accurate.

This appearance seemed to suggest the presence of an intraocular foreign body at the 11-o'clock position and possibly another at the 6-o'clock position. Radiologic examination by Sweet's method revealed a piece of

* Duke-Elder, W. S.: Textbook of Ophthalmology. St. Louis, Mosby, 1954, v. 6, p. 6168.

wire in the region of the ciliary body at the 11-o'clock position.

The next morning under general anesthesia, a conjunctival incision was made and the sclera exposed. The end of the wire was then seen projecting one mm. above the surface of the sclera. This was seized with forceps and the piece of wire eight mm. in length was withdrawn from the ciliary body. The conjunctiva was closed and one million units of crystalline penicillin were injected under the conjunctiva. Atropine was instilled each day and the patient made steady progress.

He was discharged from the hospital six days later and instructed to continue to instill atropine drops into the eye three times daily. At this time there was no apparent change in the state of the vitreous although the eye was less inflamed. Ten days after the operation considerable absorption of the exudate had occurred and vision had improved to 20/60.

Five weeks after the operation his vision had improved to 20/40. The masses of exudate had absorbed completely but there was still a haze in the lower part of the vitreous. He was seen the last time four months after operation when the eye appeared perfectly normal. No traces of exudate could be seen with the ophthalmoscope, nor could any cells be seen in the anterior vitreous with the slit-lamp. His vision had returned to 20/20. One year later his parents wrote that the vision of the eye and its appearance were normal.

Dr. G. E. Delory of the Department of Biochemistry of the University of Manitoba kindly analyzed the piece of wire and reported:

"The sample weighed 2.2 mg. Analysis for copper by the sodium diethyldithiocarbamate method showed a copper content of 85 percent. Qualitative tests for iron, zinc, phosphorus, tin, nickel, and manganese were negative. The small amount of material available prevented further analysis."

Winnipeg Clinic.

Ophthalmic Miniature

> . . . and so abroad by water to Eagle Court in the Strand, and there to an alehouse met Mr. Pierce, the Surgeon, and Dr. Clerke, Waldron, Turberville, my physician for the eyes, and Lowre to dissect several eyes of sheep and oxen, with great pleasure, and to my great information. But strange that this Turberville should be so great a man, and yet, to this day, had seen no eyes dissected, or but once, but desired that Dr. Lowre to give him the opportunity to see him dissect some.
>
> *Pepy's Diary*, July 3, 1668.

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

MEMPHIS EYE, EAR, NOSE, AND THROAT SOCIETY

EXOPHTHALMOS DUE TO HYPERTHYROIDISM

DR. H. CONDRON presented a 44-year-old Negro who was admitted to the hospital because of pain and redness of the right eye. This had developed over a period of three weeks and was associated with photophobia. It was noted that the eyes were prominent on admission and the patient stated that they had been so most of his life and had probably become worse in the past two years. The patient had a corneal ulceration in the right eye, in 1947, and no exophthalmos was recorded at that time. There was impairment of vision in the right eye over the past few months. Appetite has been good and he has been eating more than usual lately; however, there had been approximately 16 pounds weight loss in the three months prior to admission.

Physical examination. A tall, thin, well-developed Negro in no acute distress. A definite prominence of both eyes, more so on the right, was noted. Exophthalmometer readings: 25 right, 23 left. There was periorbital edema involving both eyes, with definite lid lag and some impairment of conversion. Both eyes were inflamed. The right showed an exposure-type keratitis of the inferior one third of the cornea. The thyroid isthmus was palpable. The gland did not appear to be enlarged. Blood pressure: 150/70 mm. Hg. Pulse: 120 at rest. The remainder of the physical examination was normal.

Laboratory data. The CBC, urine, and blood studies were all negative. The basal metabolism rate was +30 percent. Electrocardiogram revealed sinus tachycardia. The iodine-uptake studies revealed a definite hyperthyroid type of involvement.

Hospital course. The initial impression was thyrotropic exophthalmos and, shortly after admission, the patient was transferred to the medical service for workup. Local treatment was given for the eyes and on March 25th, a right tarsorrhaphy was performed to prevent any further extension of the exposure keratitis. Medical workup established the diagnosis of hyperthyroidism. Surgery was contraindicated because of the possibility that progressive malignant exophthalmos might develop, so the patient was treated with radio-active iodine; during this treatment there was no aggravation of symptoms. The patient was discharged on May 5, 1954. Follow-up examinations revealed no essential change in his eye conditions.

Diagnosis. Hyperthyroidism without evident goiter. Exophthalmos due to hyperthyroidism, with conjunctivitis and keratitis.

GLAUCOMA DISCOVERED AFTER FOREIGN BODY

DR. H. G. FARISH reported the case of L. P., a Negro, aged 71 years. He was first seen in the Gailor Eye Clinic on April 12, 1954. His chief complaint at that time was "can't see good—vision is blurred." In October, 1953, he first noticed "little black spider webs" and "bunches of hair" in his field of vision. In December, the right eye became painful, with the pain for the most part localized in the globe but sometimes radiating over the frontal ridge to the forehead. He described this pain as a dull ache. The pain was continuous day and night with few remissions. Also, in December, he noticed loss of vision to the extent that he couldn't distinguish the identity of his friends at a moderate distance of 50 yards. His vision, subjectively, returned almost to normal until about two weeks before his first visit to the clinic. The pain was intermittent in character and not as severe between December and April.

The physical examination on April 12th, done by a student and checked by a junior staff man, showed vision of 20/50, O.D.; 20/40, O.S., without correction, and 20/30, O.D., O.S., and O.U. with correction. He could read J2, O.U., with correction. The external examination of the eye was negative. The pupils were oval and sluggish to direct light. Extraocular movements were normal. On confrontation test there were no gross abnormalities of the visual fields. The funduscopic examination was essentially normal. However, it does mention that there was "good" cupping of the discs, and that two black pigmented areas were seen on the retina temporal to the disc. There was no tactile tension recorded and obviously no tonometric reading was done at this time.

On this date a diagnosis of presbyopia was made and he was given an appointment for a manifest refraction on May 25th.

His past medical history revealed that he had a herniotomy in June, 1946, a subtotal gastrectomy for duodenal ulcer in May, 1951, and, at the present time, is under observation and treatment by the Proctology and Medical Departments for hemorrhoids and diverticulitis. A barium enema in December, 1953, revealed diverticula of the descending and sigmoid colon. On May 6, 1954, he was advised to enter the hospital for gastrointestinal surgery to which he has agreed. However, the operation has been postponed for lack of blood donors. Serologic test for syphilis was negative. There was no history of trauma to the right eye.

When the patient returned on May 25th for a manifest refraction, preliminary examination showed that his right eye was severely injected—as it had been for two weeks. The patient said that he had been filing steel hoes. Inspection revealed a minute metallic foreign body imbedded in the cornea near the nasal limbus. This was removed easily with the tip of an hypodermic needle under the slitlamp. Aureomycin ophthalmic ointment was instilled and a tight patch applied. No atropine was instilled or prescribed at this time. The refraction was postponed and no further examination was done.

On June 3rd, he returned by appointment for a refraction. At this time he complained bitterly of severe pain in the right eye. The external examination revealed a steamy cornea, widely dilated pupil which was maximal, severe scleral injection, and hyphema almost obscuring the pupillary area. Vision, O.D., was light perception only and the fundus reflex could not be seen. Intraocular pressure in the right eye was 52 mm. Hg with the 10 gm. weight; within normal limits for the left eye. The cornea stained diffusely with fluorescein. He was immediately admitted to the hospital for active treatment and investigation, with a diagnosis of secondary glaucoma, hyphema of unknown etiology, and corneal dystrophy.

Further questioning of the patient at this time brought forth the fact that he had returned to the clinic on May 31st complaining of a painful right eye. As it was not his regular appointment day, he was not sent up to the clinic but told to return on June 3rd by a member of the resident staff. Evidently in desperation, he visited a doctor, identified by him as an "eye doctor," who prescribed "clear drops" to be instilled in the right eye twice daily and "milky drops" every four hours.

In the hospital he was given Diamox, 750 mg. initially, and 500 mg. twice daily in the morning and afternoon. Pilocarpine (four percent, every two hours) and eserine (0.25 percent at bedtime) also were prescribed. The eye was patched and hot compresses applied every three hours. On June 4th a paracentesis was done. Aqueous was released without evidence of markedly increased pressure. No blood extruded and no attempt was made to irrigate the anterior chamber. The intraocular pressure remained above normal for a time and then dropped to 25 mm. Hg (Schiøtz). The hyphema absorbed almost completely by June 6th. The fundus reflex still could not be seen on that date when vision was light projection and hand move-

ments at one foot. On June 8th, the cornea no longer stained with fluorescein and the intraocular pressure was R.E., 28 mm. Hg; L.E., 13 mm. Hg.

The differential diagnosis in this case is: (1) Secondary glaucoma following iritis due to foreign body on cornea, and precipitated or aggravated by atropine administration; (2) primary glaucoma, chronic simple compensated, not recognized on the original visit to eye clinic; (3) foreign body in the anterior chamber; (4) intraocular tumor.

Herpes cornea and vitamin-A deficiency

Dr. Alice R. Deutsch presented Mr. H. F., a white man, aged 42 years, who was seen at the office for the first time on July 29, 1954. He complained of photophobia and impairment of vision of his right eye. He also stated that he had had a pterygium operation on both eyes; that he had a duodenal ulcer and had had to watch his diet for several years.

At this time he had a mild blepharitis and the plicae semilunaris showed a peculiar grayish-brown localized pigmentation. The conjunctiva of the lids and globes was not injected. Scars following the pterygium operations were visible at the nasal limbus of each eye. The right cornea showed a central superficial, sharply delineated cloudiness. At this site the corneal epithelium stained with fluorescein. The corneal sensitivity seemed to be decreased in each eye. Under the slit-lamp, the anterior half of the corneal parenchyma, corresponding with the lesion, was very edematous. The corneal nerves were well visible and numerous in both eyes. The intraocular pressure was normal to palpation. No abnormalities were visible in the fundi. Vision was: O.D., 20/30; O.S., 20/25+2. A tentative diagnosis of herpes corneae of the right eye was made and adequate treatment started.

When he returned 10 days later, he was much worse, though he himself was apparently not quite aware of it, as the pupil was dilated and he had no pain. There was no injection in either eye. The lesion of the right cornea now measured six mm. in diameter, was diffusely outlined, and a yellowish line of interstitial infiltration was visible close to its lower border. The left cornea showed a similar edematous area three mm. in diameter just below the center. There was no infiltration visible in this eye. The conjunctiva had a peculiar wrinkled appearance, especially on the temporal side, but no keratinized spots were present. The Schirmer test was negative. The manifestation of a nutritional disturbance was obvious.

When the history was reviewed Mr. F. reported that for several months he had not eaten anything but cooked cereals and milk and occasionally one soft-boiled egg. That was the temporary diet given to him when he had the last acute ulcer attack months previously.

The workup of this case was difficult and, therefore, is not complete. The smear of the conjunctiva bulbi taken close to the limbus showed many xerose bacilli. The smear taken from other parts of the conjunctiva was negative. Dark adaptation was not measured but the patient did not complain of night-blindness. The tongue was very red and dry; the gums were swollen and bled easily on pressure; the lips and skin of the face were dry and there were fissures at the angles of the mouth. Complete blood count and urinalysis were within normal limits. Serum calcium was normal, 10 mg. percent. The Kahn test was negative.

Pillat in his paper "Eye changes in vitamin-A insufficiency in adults" mentioned isolated cases without night-blindness. Nevertheless the present case was considered to be a combined vitamin insufficiency and not a mere vitamin-A insufficiency. Besides mydriatics and local ophthalmol ointment (White A & B ointment), one capsule of Therragren daily (vitamin A, 25,000 U.S.P. units, vitamin D, 1,000 U.S.P. units, thiamin, 10 mg., riboflavin 5.0 mg., niacinamide, 150 mg., ascorbic acid 150 mg.) was prescribed.

He was asked to return the next day but

did not return until August 26, 1954. At this time the right cornea was clear except for a streak-shaped superficial opacity in the lower quadrant, corresponding with the former infiltration line. The left cornea was entirely clear. Neither cornea stained with fluorescein. The media were also clear under the slitlamp. The corneal nerves still appeared thickened. The pigmentation at the plicae was less apparent. The tongue, gums, and lips looked normal and the skin was less dry. The patient had followed the instructions conscientiously but had not had the physical checkup as advised.

If a more detailed history had been taken at the first office visit, it would have been possible to make a correct diagnosis at that time, in spite of the fact that the corneal disease was restricted to one eye only. The lack of inflammatory changes together with the peculiar pigmentation of the plicae and the dryness of the skin did not coincide with the picture of corneal herpes. The other signs, namely decreased sensitivity of the cornea and increased visibility of the corneal nerves, are characteristic of herpes cornea and vitamin-A insufficiency.

Daniel F. Fisher,
Secretary of the Eye Section.

MADRID OPHTHALMOLOGICAL SOCIETY

June, 1954

Dendritic keratitis

Dr. Marin Amat said that the various contributions describe the herpetic virus as seeming to be an ultrafiltrable virus which attacks the skin, mucous membranes, the eye, and the nervous system. It would thus seem to be neurodermotropic, causing a spontaneous infection only in man where it is usually in a latent state in the mouth, tonsils, and pharynx. Saliva is the principal medium for its propagation. It may also be latent in the conjunctiva and in the lacrimal sac.

Gruter claims that the virus of herpes febrilis may be the etiologic agent for the corneal involvement. The recent work of Braley described four types of herpetic ocular infections. Braley also mentioned that the virus of herpes simplex has a special affinity for the nuclei of epithelial cells where it remains latent until some external or internal stimulus frees it, when it produces dendritic ulcers. During the latent period, the nuclear membrane condenses to protect the virus which, however, can be released by other substances acting on the nuclear membrane. The virus can also be neutralized by antibodies fixed in the cells, or circulating "aggressins." On the other hand, other substances, such as cortisone, may lessen the protective efficiency of the nuclear membrane and interfere with the action of the aggressins, making use of such agents a potential danger. This also explains why certain affections (malaria, grippe) are predisposing factors to the development of herpes cornealis. Fever, in general, liberates large quantities of suprarenal hormones, among which is cortisone. Powerful emotional crises may have the same effect.

Braley's experiments where he inoculated the virus of herpes into the brains of rats, sometimes in a pure state, at other times mixed with aureomycin, have shown that there were several varieties of the virus. From the attempts which he made with antivirus substances, folic acid deserves special mention because, in tissue cultures containing the virus, it combines with ribonucleic acid to form a substance impenetrable to the virus, which dies because of lack of ribonucleic acid. However, this does not take place in the patient because the herpes virus, when it invades the nucleus, consumes all the ribonucleic acid, and, therefore, the folic acid has nothing with which to combine.

The chronicity of herpes corneae may lead to total blindness and, rarely, to complete adipose degeneration of the cornea.

An infection with herpes does not produce immunity in man.

Of specific treatment Dr. Amat mentioned:

The classic treatment of Gruter was discontinued because, although it produced cures, it also produced extensive trauma.

Local agents, such as applications of tincture of iodine, alcohol, sulfuric acid, copper sulfate, antibiotic salves, use of the patient's own blood, and so forth, are employed.

Best results were obtained with applications of tincture of iodine. There was also complete cure in one case with smallpox vaccine.

Since the local application of tincture of iodine is very painful, it is better to use anesthetic drugs such as local application of cocaine. In dendritic keratitis tiny amounts of cocaine are applied with a fine glass rod and the deeper furrows are touched with tincture of iodine.

Discussion. Dr. Rio Cabenas referred to a case published by Heat in the January, 1954, issue of the *British Journal of Ophthalmology*, which shows the deleterious effects of cortisone in herpes of the eye. It was a case of a 34-year-old patient who, in 1932, had suffered from keratitis herpetica. In 1952, he was again treated with iodine, atropine, and aureomycin. The patient improved. Several months later he returned to the clinic with a generalized keratitis with secondary iritis and spastic pupils. As the patient had a conjunctival reaction to atropine, he was given 0.5-percent cortisone. Twelve days later the patient came down with meningitis. The author believes that the pathogenesis of this complication was due to the treatment with cortisone which lowered the local defenses against the infection.

The virus is thermolabile; therefore it is proper to use radiant heat or gaseous cautery. It is also sensitive to various antiseptics, for example, methylene blue. In herpetic lesions there is necrosis of the epithelium with the production of lipoid substances. Scraping of the cornea eliminates mechanically the dead tissues; ether and alcohol dissolve the fats. These are the fundamental procedures of Gruter.

The treatment proposed by Dr. Marin Amat, with powdered cocaine and applications of tincture of iodine, follows the same principles, the destructive action of the cocaine on the epithelium and the dissolving effect of the tincture of iodine on the lipoids, and the antiseptic effect of the iodine.

Let us hope there will soon be an antibiotic which will be really effective. At present penicillin is ineffective in corneal herpes. Aureomycin is perhaps the best. Some authors claim it has cured their patients in four to seven days. I have also used it with good results. Streptomycin is also valuable; experimental tests on encephalitis herpetica of rats have shown its inhibitory effect. Cortisone, as is agreed by various authors, has bad effects.

Dr. Arjona said that he had seen many cases of herpetic keratitis in Madrid during the winter in connection with an epidemic of bronchitis and grippe of virus origin. He confirmed the value of the therapeutic methods outlined by the previous speakers, specifically the use of aureomycin and the application of the tincture of iodine. He believes there must be different strains of the virus of greater or less virulence.

Dr. Marin Amat thanked the discussers and emphasized the importance of the information that cortisone has an injurious effect in corneal complications produced by the virus herpes simplex.

Complications of cataract surgery

Dr. F. Silvan Lopez read a paper on infrequent and serious complications in cataract surgery. He described three cases.

In one there was intraocular fibrous organization following electrocoagulation of a fistula, resistant to cure by other methods (conjunctival covering, suture, cauterization with trichloracetic acid and with the galvanic current). It was cured by electrocoagulation

but there developed newly formed fibers which finally led to secondary glaucoma. There was a slight loss of vitreous following the total extraction of the lens. Probably the incarceration of some vitreous in the wound, together with metabolic disturbances due to mild diabetes, prepared the way for the fibrous proliferation.

The second patient with pronounced diabetes developed, in spite of all treatment, a prolonged iridocyclitis, with intense fibrous and vascular proliferation, 30 days after the operation. Biomicroscopy before the operation showed no signs of rubeosis or of ocular hypertension. The process was resistant to all forms of treatment but it always improved when normal insulin was resumed.

These two cases teach us:

1. The necessity for intensifying treatment of the diabetic condition, utilizing only normal insulin and without delay.

2. Make sure that all collyria used are perfectly sterile, especially in diabetics.

3. Not to employ electrocoagulation in any case of operative fistula.

4. Try to make the operation intracapsular and not lose any vitreous.

The third case was a spontaneous rupture of the posterior capsule of the lens. The nucleus of the lens fell into the vitreous and could not be extracted. A hypertensive iridocyclitis, which was resistant to all treatment, followed.

We can learn from this case, which showed no previous abnormality, the need, immediately after the luxation, to place a firm sclerocorneal suture and to inject air into the anterior chamber. The patient should be immediately placed in the prone position so that the luxated lens will come forward into the anterior chamber. Immediately inject a drop of acetylcholine to contract the pupil behind the lens. Otherwise one has to use the cystotome. It is imperative to remove the luxated lens as it is not tolerated by the eye in about 50 percent of the cases.

Discussion. Dr. Mario Esteban told of one rare postoperative complication in a case published several years ago in the *Archives*. It was in a diabetic whose glycosuria and glycemia were reduced to normal previous to the operation. There was an intracapsular extraction without incident but the wound did not heal. Several days later there was no anterior chamber and the iris was in contact with the cornea. A drop of pilocarpine salve with an antiseptic and dionin was applied. The wound healed and the anterior chamber was reformed but the eye showed a highly scintillating, brilliant spherule as seen with the slitlamp. It was a drop of the salve which acted as a foreign body and produced a violent iridocyclitis. The condition finally cleared with application of shortwave therapy. Since then I never apply a salve to a wound of this nature.

Dr. Arjona said that he had a similar complication to that of Dr. Silvan Lopez, complete luxation with disappearance of the lens into the vitreous during the operation. He immediately applied a loose suture, the patient was placed face down so that the effect of gravity would pull the lens down. He placed himself beneath the face of the patient, the lens appeared in the anterior chamber, and he pulled it out alongside one edge of the suture, with only slight loss of vitreous.

The president thanked all the participants. He recognized that, in the first case, there may have been epithelization of the anterior chamber; this would cause a fistula but not the subsequent complications. The secondary glaucoma came much later and followed pupillary seclusion. In the second patient there was no rubeosis seen by preceding biomicroscopy nor increase of ocular tension. Dr. Arjona's methods follow in general those we have used.

Joseph I. Pascal,
Translator.

COLLEGE OF PHYSICIANS

Section on Ophthalmology

November 18, 1954

Dr. Edmund B. Spaeth, *Chairman*

17th Annual deSchweinitz Lecture

Dr. Conrad Berens, New York, presented the lecture. His subject was "Evaluation of certain glaucoma operations with especial reference to cycloelectrolysis, cyclodiathermy, and iridocorneosclerectomy." The choice of an operative procedure for the control of tension in glaucoma should be carefully considered not only for its mode of action but also for the overall long range performance of the operation. The evaluation of the procedure should include the control of tension within normal limits without or with the use of miotics, the increase or preservation of the preoperative visual fields and visual acuity postoperatively, and the immediate and long-range postoperative complications.

The compilation of 239 eyes affected with all types of glaucoma, in which cycloelectrolysis was performed and observed postoperatively for a period of from two to nine years, revealed that 32 percent of these eyes were controlled without miotics and 33 percent with miotics, for a total of 65 percent of the eyes in which tension was controlled under 25 mm. Hg (Schiøtz). Vision improved or remained unchanged in 62 percent of 225 retained eyes in this series. One percent of the eyes became atrophic. Other complications encountered were: iridocyclitis, one-plus percent, and absolute glaucoma, three percent of the eyes.

Anterior cyclodiathermy was performed in 264 eyes affected with all types of glaucoma and observed postoperatively for from one to 14 years. Five percent of the eyes were controlled without miotics and 24 percent with miotics, for a total of 29 percent of the eyes in which tension was controlled under 25 mm. Hg (Schiøtz). Vision in 224 retained eyes improved or remained unchanged in 17 percent of this series. The more serious postoperative complications observed in this series of 224 retained eyes include: atrophic globes, 11 percent; phthisis bulbi, four percent; hemorrhage of the anterior chamber, nine percent; vitreous hemorrhage, three percent; uveitis, four percent; cataract, two percent.

The prognosis following retrociliary diathermy in 127 eyes, observed postoperatively for from one to four years, is poor. Only four percent of the eyes were controlled without miotics, and 22 percent with miotics for a total of 26 percent of the eyes in which tension was controlled under 25 mm. Hg (Schiøtz). Vision improved or remained unchanged in 35 percent of 114 retained eyes. The postoperative complications include: atrophic globes, 6.5 percent; phthisis bulbi, two percent; hemorrhage in the anterior chamber, five-plus percent; vitreous hemorrhage, one percent; iridocyclitis, one percent; absolute glaucoma, one percent; and panophthalmitis in two percent.

Of the two most used procedures designed to diminish the formation of aqueous, cycloelectrolysis seems to be more effective than cyclodiathermy, with fewer postoperative complications. The long-range prognosis following anterior cyclodiathermy is discouraging, and the results of retrociliary diathermy are poor with a high percentage of atrophic eyes resulting from both of these procedures. Because most increased tension results from diminished outflow, and the hypotensive effect of operations like cyclodiathermy and cycloelectrolysis is often of short duration, these procedures should be reserved for cases in which filtering operations are contraindicated, or when outflow following a filtering procedure is mildly inadequate.

In evaluating operations producing subconjunctival filtration, the results following iridocorneosclerectomy were found to be superior to those following simple iridencleisis and iridencleisis combined with sclerectomy.

In a series of 511 eyes observed for from

one to 24 years following iridocorneosclerectomy for all types of glaucoma, tension was controlled under 25 mm. Hg, without miotics in 30 percent of the eyes, and with miotics in 47 percent, for a total of 77 percent of the eyes controlled. Vision improved or remained unchanged in 56 percent of the 487 retained eyes. Atrophy of the globe occurred in one eye; phthisis bulbi, two eyes; absolute glaucoma, three eyes; iritis, two eyes; iridocyclitis, one eye; uveitis, two eyes; vitreous prolapse, one eye; synechias, one eye; cataract, one eye; and hemorrhage in the anterior chamber in one percent of the eyes.

The results of iridencleisis for various types of glaucoma in 501 eyes, observed for from one to 14 years postoperatively, revealed that the tension was controlled without miotics in 14 percent, and in 38 percent with miotics, making a total of 52 percent in which tension was controlled under 25 mm. Hg (Schiøtz). Vision was improved or remained unchanged in 40 percent of 481 retained eyes. The complications include: atrophic globes, one percent; phthisis bulbi, two percent; absolute glaucoma, three percent; iridocyclitis, one percent; cataract, four percent; dislocated lens, 1.5 percent; and hemorrhage into the anterior chamber, eight percent. Severe uveitis which was diagnosed as possible sympathetic ophthalmitis was reported in two eyes, a case of questionable sympathetic ophthalmitis in one patient, and proven sympathetic ophthalmitis in a fourth.

The postoperative results of iridencleisis combined with sclerectomy in 100 eyes affected with chronic simple glaucoma, observed for from one to nine years, show that tension was controlled without miotics in 29 percent of the eyes and with miotics in 44 percent, making a total of 73 percent of the eyes in which tension was controlled under 25 mm. Hg (Schiøtz). Vision in 96 retained eyes showed improvement in 28 percent, and was unchanged in 27 percent of the eyes.

When a fistulizing operation is indicated and especially when cycloelectrolysis is contraindicated, iridocorneosclerectomy seems to be the operation of choice and has controlled tension and preserved visual acuity over a long period of time, with a minimum of complications encountered in eyes observed for from one to 24 years.

William E. Krewson, 3rd,
Clerk.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

December 6, 1954

DR. FREDERICK H. THEODORE, *President*

PATHOLOGY AND TREATMENT OF OPTIC-NERVE DISEASES

DR. JOSEPH IGERSHEIMER delivered the eighth annual Mark J. Schoenberg Memorial Lecture, under the auspices of the New York Society for Clinical Ophthalmology and the National Society for the Prevention of Blindness.

First a few problems of more general character were discussed.

Pallor of the disc is considered due either to a reduction of very fine blood vessels in the region of the disc, or to a neoformation of neuroglia, or both. This is probably correct, but there are some puzzling problems. In a case of acute retrobulbar neuritis, while the optic disc still had normal color, there was quite a reduction in the number of fine blood vessels on the disc.

It is also strange that the disc often becomes pale when the pathologic process is in the intracranial part of the optic nerve; in such cases it is difficult to attribute the pallor to the reduction of blood vessels or a neuroglia overgrowth in the most distal part of the optic nerve.

A few pathologic slides were shown concerning the strange relationship between the retina and optic nerve. In the first case the retina showed a very intensive retinopathy,

but the optic nerve on section was absolutely normal. In another case there was slight retinopathy and a normal-colored disc, and on section intensive degeneration in the optic nerve just behind the globe.

The physiologic block (Cushing) was demonstrated by a few clinical cases. Some cases showed an immediate response to removel of pressure against the optic nerve or the chiasm after operation or X-ray treatment of a pituitary tumor. In other observations the improvement came quite a time after the pressure was relieved.

The first of the more special topics concerning optic-nerve diseases was papilledema. Anatomic study of a very early stage of papilledema showed a degeneration in the chiasm. Other observations concerned the sudden loss of vision after a decompression operation in cases of papilledema which had good vision before the operation. One such case could be examined anatomically and there was total degeneration of the nerve examined with the Marchi method. Tabetic optic atrophy is nowadays often called primary syphilitic optic atrophy. This is so because syphilologists and neurologists think that all kinds of neurosyphilis have a meningeal inflammation and that the degeneration of the optic nerve fibers is caused by the inflammation of the pia of the nerve, often penetrating into the nerve itself. Five clinical and anatomic arguments were presented from an ophthalmologic point of view, not in agreement with the conception that this optic atrophy is caused by a meningeal inflammation and usually starts intracranially.

In a discussion of arterio- and arteriolosclerosis of the optic nerve, clinical and anatomic experiences were presented indicating the importance of the small vessels in the optic nerve as an etiologic factor for optic atrophy. The details of the response of the optic nerve to changes in these fine vessels are not yet known.

Optic nerve damage in malignant exophthalmos was the final topic. Cases of progressive exophthalmos were cited where the central vision was failing to a dangerous degree and where a central scotoma could be demonstrated. This visual field defect was apparently caused by pressure alone. If the disc does not show a beginning optic atrophy, the visual function can be restored either by continuation of thyroid therapy or by a decompression operation. A papilledema with great reduction of visual acuity can be seen in such cases.

Jesse M. Levitt,
Recording Secretary.

Ophthalmic Miniature

> . . . and then to Westminster to Dr. Turberville about my eyes, whom I met with; and takes time before he did prescribe me anything, to think of it.
>
> *Pepy's Diary*, June 23, 1668.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

JONAS STEIN FRIEDENWALD
(1897-1955)

For there is hope of a tree, if it be cut down, that it will sprout again, and that the tender branch thereof will not cease. *Job,* 14:7.

During the last meeting of the American Academy of Ophthalmology and Otolaryngology held in October, at Chicago, word of the mortal illness of our fellow member, Jonas Friedenwald, spread with heavy hearts throughout the entire membership. It seemed incredible to each one of us that a life so brilliant and flaming, so important, so fruitful in the past, so promising for the future, was about to end. Frustrated in our helplessness, we faced the moment of truth severely shaken.

Elsewhere, in this issue, three dear

friends, colleagues, and devoted disciples of his, describe in a few austere paragraphs some of the salient features of his life. The tight, scientific sentences used are those that Jonas would have appreciated, for his own style was like that. Yet, running through it all, is an undercurrent of deep affection, respect, and total admiration for this man and his accomplishments. All of us who knew him, if only in his writings, share these feelings and this sorrow.

It will, however, take much more than a brief obituary adequately to convey the many sided portrait of this man of our time in American ophthalmology. In these columns there is no space to describe the background of his family life, the influences for great good of his grandfather Aaron, pupil of von Graefe, Liebrich, Schweiger, Arlt, Virchow, DuBois, Reymond, Helmholtz, and Müller, or his father Harry, pupil of Hirschberg and Politzer, professor of ophthalmology and otology at the College of Physicians and Surgeons, author of more than 125 scientific papers, among them the classic, "Jewish Luminaries in Medical History," chairman of the Section on Ophthalmology A.M.A., and president (1937) of the American Ophthalmological Society, and many other evidences of his scientific learning and contributions; or of his mother, Bertha, whose influence on him was probably the most important of all.

Born and raised in a family of scholarly and intellectual Jewish culture, whose Head read fluently of the Hebrew, Greek, Latin, German, French, Spanish, and Portuguese languages, and spoke many of them well, the lively and quick intelligence of Jonas was beautifully nourished. It developed into the superb instrument that we all knew and admired so much, without arrogance or intolerance toward the many of us who are his intellectual inferiors.

The memory of his intellect will be forever perpetuated in his significant contributions to our science. But, the memory of his gentle smile, his kindly nature, his patience with those of us who could not follow his erudite arguments and the lucid flow of his talk in discussions will die out with us, more is the pity.

The "tender branches" which he had sprouted in ophthalmology are already developing into sturdy trees, and we are grateful that his precepts, teachings, and influence will endure.

On the occasion of the death of Samuel Johnson, an ancient friend is reported to have said "He has made a chasm, which not only nothing can fill up, but which nothing has a tendency to fill up.—Johnson is dead.—Let us go to the next best:—there is nobody;—no man can be said to put you in mind of Johnson."

We feel the same about Jonas Friedenwald.

Derrick Vail.

FEDERATION OF EYE-BANKS

At the time of the meeting of the American Academy of Ophthalmology and Otolaryngology in Chicago, representatives from 12 eye-banks in this country and Alaska met to form a loose federation. It is hoped that this federation will permit an exchange of ideas and experiences that will be mutually beneficial. In addition, it may help to prevent some of the undesirable publicity that has been associated with corneal transplantation.

The first eye-bank was set up in New York in the early part of 1944 by Dr. R. Townley Paton in conjunction with Mrs. Eleanor M. Lehr, a doctor's widow who happened to be a patient of his. It was some time in May of that year that the first eye came in. In response to a letter, Dr. Paton stated: "As the Manhattan Eye and Ear Hospital had no 24-hour telephone service, it was decided to use the New York Hospital for a time in view of the fact that they were also equipped to run the Plasma Bank. Later the activities were shifted back to the Manhattan Eye and Ear Hospital and the work

expanded; special containers were made and printed instructions for removal of eyes were made available, and the publicity campaign was started with the approval of the Census Bureau of the Academy of Medicine." Some time later Mrs. Breckinridge became associated with the work, and the eye-bank became incorporated. This was followed by the gradual development of eye-banks in various parts of the country.

In the beginning, it was felt by many that corneal banks were unnecessary and that sufficient eyes could be obtained through the usual enucleations to supply the demand. Experience, however, has shown that this is not true. For example, at this meeting it was brought out that in the New York eye-bank there were 30 patients who were waiting for eyes for corneal transplantation, and in Alaska there were 75 patients waiting for eyes. From this it is apparent that there is a real need for eye-banks.

The donation of one's eyes after death so that someone may again see has had a great public appeal and has resulted in a great deal of publicity, some of which has been undesirable and misleading. This has been in some instances the result of an attempt to create greater interest in a drive for funds and in some instances for personal reasons. For example, one organization, in an appeal for funds, stated: "You should know . . . we use donated eyes to . . . (b) use the eyes for research in our modern, well-equipped research laboratory to find cures for eye diseases and ways and means to prevent blindness. Our recent discovery of a cure for detached retinas will prevent blindness from that cause to all persons everywhere, forever!" And, again, "this method is now free to the whole world. No one need go blind anymore anywhere because of a detached retina."

Where funds are solicited by private individuals or service organizations there is a tendency to misrepresent the facts in an attempt to obtain publicity in the drive for funds, which, incidentally, are necessary for the survival of many eye-banks. It was pointed out that in New York all publicity in regard to the eye-bank is cleared and approved by the board of censors of the local medical society. If institution eye-banks were members of this federation, it would be possible to insist that the eye-banks must follow the rules of the federation and that all publicity must clear the local county medical society, thus helping to solve one of the difficulties confronting medical directors of eye-banks.

In this discussion it was pointed out that the control of eye-banks should be in the hands of medical organizations, especially teaching institutions. This was borne out by the report of an investigation of one eye-bank run and controlled by a lay group. The society stated as its purpose the solicitation of pledges from individuals throughout the United States to provide corneas for corneal transplantation. This was done by an annual seal campaign. The data obtainable would indicate that it is exclusively a lay organization, no medical organization, no medical personnel being listed among its officers. The unaudited report for one year listed a cash balance of over $20,000.00. In its pamphlet the society states that "If no surgeon is available . . . the society will then try to contact an eye surgeon who has performed this type of work and obtain his opinion as to the advisability of a corneal transplant operation." It also implies that there are only three hospitals in the United States where corneal transplants are performed. This work is carried out in an area that has two well-established university eye-banks which do not solicit funds and which have never received eyes from this organization. Thus a nonmedical organization sets itself up as competent to pass judgment on qualifications of eye surgeons performing corneal transplantation. The importance of these banks being associated with teaching institutions with research facilities has been brought home by some recent important work that has resulted from the study of eyes that had been used for corneal transplantation.

The value of informal discussion of the problems of eye-banks was brought out at this meeting. For example, the question of prevention of infection in these transplants was discussed and one of the men present described a method of sterilization that has not been generally known which has proven itself to be effective. One eye-bank has had sufficient experience with babies' eyes to warrant the statement that eyes of babies under two years of age should not be used. These two statements illustrate the value of this free interchange of experience.

Among the problems that such a group could consider were listed: evaluation of the length of time between death and use of the cornea without interfering with its usefulness; development of better containers for the shipment of enucleated eyes; a universally effective type of sterilization of the enucleated eyes.

It was brought out that there are certain legal aspects that must be considered in regard to the enucleation of eyes. State laws differ a great deal in the various states. For example, in California it is stated in Section 20 of the Probate Code (Assembly bill 797, 1947) that "an individual . . . may, by will, dispose of the whole, or any part of his or her body to a teaching institution, university, college, State Director of Public Health, or legally licensed hospital." With co-operation of the various eye banks it might be possible to establish a universally satisfactory law in the various states. The importance of complying with the local laws was brought out rather forcefully by the experience of one of the men attending the conference.

The development of a booklet describing the routine of transplant of the cornea together with the directions of the procedure of donating the eyes could be worked out by such a group, providing, however, that the laws of the various states were considered. These could then be printed in large quantities at a great saving to the various eye-banks. In this event, it would only require that each eye-bank have its own cover printed. Such a book, in addition to answering the usual questions, would be very helpful in the establishment of new eye-banks.

The question of a charge for the recipient cornea was discussed. It was the consensus of the group that no charge should be made to the patient for the cornea used, as eye-banks have been built up on the basis of donation of the eyes to be used without a charge being made to a recipient of the cornea. The expense of eye-banks must be met either by a budget allowance of the institution where the bank is situated, or by donations made by organizations interested, or by private donations. It is, however, important that these banks be under the absolute control of medical men, so that the publicity can be directed and controled in order to avoid misrepresentation of the facts in regard to this important work.

It would seem that this very loose federation of eye-banks would serve a very useful purpose, not only in the exchange of ideas and development of better methods, but also in forming an exchange for the better distribution of the available eyes. Another meeting of this group will be held at the time of the Academy meeting next year. Incidentally, this group of eye-bank representatives is in no way in conflict with the official A.M.A. Committee on Eye-Banks.

Frederick C. Cordes.

OBITUARY

JONAS S. FRIEDENWALD
(1897-1955)

Jonas Friedenwald's death on November 5, 1955, is unquestionably one of the greatest possible losses to ophthalmology and to a host of scientific and nonscientific organizations. It is also a severe and irreparable shock to his many friends. Nor does the prior knowledge that he had inoperable carcinoma mitigate our distress at the final news that he has left us.

Jonas Friedenwald was a prominent member of a prominent Baltimore family.

JONAS S. FRIEDENWALD, M.D.

His father, Harry Friedenwald, had been for many years head of the department of ophthalmology at the College of Physicians and Surgeons, Baltimore, and a distinguished figure in ophthalmic and Zionist circles.

Jonas was born in 1897 in Baltimore, educated in Baltimore (A.B., Johns Hopkins University, 1916; M.D., Johns Hopkins Medical School, 1920), and, except for occasional study periods elsewhere (M.A., Harvard, 1922), he lived continuously in Baltimore.

His catholic interest and authority made him a scholar in many fields. He was unquestionably one of this country's outstanding ophthalmic pathologists; he was also one of the foremost investigators with specific interests in histochemistry, ophthalmic biochemistry, problems of intraocular fluid movement, and ophthalmic biochemistry in general. His publications that number well over a hundred reflect the diversity of his investigations and the universality of his interests. They are just a minor part, however, of the research he suggested, organized, and supervised.

He stimulated and trained innumerable young men and was always willing to interrupt his own pursuits for the purpose of helping others. He had the ability to analyze masses of data, discarding the irrelevant and extracting the solution with uncanny insight. In the laboratories of the Wilmer Institute when experimental findings resulted in confusion, Dr. Friedenwald could always be counted on to get to the basis of the difficulty and make pregnant suggestions for its resolution. His enormous fund of knowledge and experiences was eagerly sought by students, residents, clinicians, and research men in various fields at Hopkins and throughout the country. He could discuss on equal terms with the topflight specialists many complex phases of both basic science and clinical medicine. He gave freely of his advice and time and was extremely patient with the sincere student. He could be alarmingly stern, however, with those who wanted the "quick answer" or those whose intellectual honesty deviated the slightest. His quiet, subtle sense of humor and modest, unassuming manner were well known to all who came into contact with him. His clarity of thought and lucidity of expression enabled him to put even the most complicated problems across to to his audiences— an accomplishment which made him a master moderator.

His ability to cope tactfully with administrative protocol and his high sense of ethics made him a favorite councillor on important committee posts. Withal he carried on a clinical practice and was known to be most sympathetic and painstaking in his handling of patients. In short, he was not only a great scientist, but a sensitive, understanding human being whose selflessness, simplicity, and desire to help his fellow man made him loved by all.

Jonas Friedenwald was much honored in his lifetime. He received the Research Medal of the American Medical Association in 1935, the Howe Medal of the American Ophthalmological Society in 1951, the first Proctor Award in 1948, and gave many of this country's formal lectures. Had it not been

for his terminal illness he would have given the Doyne Lecture before the Oxford Ophthalmological Congress next July. At the time of his death he was Associate Professor of Ophthalmology at Johns Hopkins Medical School, a trustee of the Association for Research in Ophthalmology, a member of the Council on Neurologic Diseases and Blindness, Committee on Standardization of Tonometers, Radiation Cataract Committee, and many other local and national committees. He was an associate editor of the *A.M.A. Archives of Ophthalmology, Ophthalmologica,* and the *Journal of Histochemistry and Cytochemistry*. He was also an active member in the American Academy of Ophthalmology and Otolaryngology, American Medical Association, American Ophthalmological Society, American Society for Clinical Investigation, Ophthalmological Society of the United Kingdom, American College of Surgeons, and American Chemical Society.

Dr. Friedenwald enjoyed the isolation of vacations with his wife in the mountains. Here was the opportunity for long walks, the consumption of volumes of literature, and the development and elaboration of theories. In recent years he spent a month or two each summer in the Grand Tetons of Wyoming, whence would come numerous long pencilled letters expressing his latest ideas on current research problems. The letters frequently contained pages of differential equations, quantitating the phenomena he was discussing. Long dissertations were often followed by "addenda" or "bulletins" with still newer concepts or corrections.

When he learned in August of his diagnosis and its poor prognosis, he wrote bravely and philosophically of his "firm determination to squeeze as much joy and interest, love and meaning out of the time still available as possible. Viewed in these terms the extent of that time is of less importance." In spite of untold difficulties and suffering during his remaining three months, he completed fundamental contributions on theoretical considerations of aqueous humor dynamics and on revisions of the calibration scales for tonometry and tonography. Such achievements as these will continue to inspire ophthalmologists in years to come.

It is with profound regret that we must record his passing. His friendship, wise counsel, and leadership will be sorely missed. His was a life that many may emulate, but few will achieve his stature. Our only solace is that his influence and ideals will live on in the minds and deeds of those of us who have been fortunate enough to know him well.

David G. Cogan.
V. Everett Kinsey.
Bernard Becker.

CORRESPONDENCE

Congenital symblepharon

Editor,
American Journal of Ophthalmology:

In his letter to The American Journal of Ophthalmology (**40**:275, [Aug.] 1955), Dr. Adamantiadis of Athens, Greece, refers to the paper by Dr. M. Wallace Friedman, entitled "Congenital symblepharon" (Am. J. Ophth. **39**:236-237, [Feb.] 1955) and claims that Dr. Friedman's case is one of epitarsus.

Without taking sides in this matter, I wish to call attention to my report of a case of epitarsus of both upper lids, in the *Eye, Ear, Nose & Throat Monthly* (**31**:487-488, [Sept.] 1952). The stereoscopic photographs which accompany this paper should be helpful in diagnosing this interesting, though rare, congenital anomaly.

(Signed) Adolph Posner, M.D.,
New York.

Corneal edema

Editor,
American Journal of Ophthalmology:

In his interesting study on "Factors in the genesis of corneal edema" which appeared in the July, 1955, issue of The Journal, Mr.

Sarwar stated that I explained "this edema" (caused by wearing of contact lenses) by "back flow of fluid from the canal of Schlemm into the cornea."

Such a statement cannot be found in any of my papers, neither verbally nor implied.

I only stated that "In addition to other effects of the contact lens, known or assumed, we have to realize that refraction-correcting contact lenses, even with very mild pressure on the conjunctival surface, may produce either the blood-influx or the aqueous-influx phenomenon and thus may decidedly interfere with normal elimination of aqueous humor. . . .

"In both cases, sufficient collateral pathways may be available in order to compensate for the alteration of the physiologic pressure gradients; in some instances, however, this may be impossible for anatomic reasons and, in these cases, the contact lens will not be well tolerated. . . .

"The reversal of current of the aqueous veins under the contact lens cannot explain all phenomena interfering with the tolerability of the contact lens but if it occurs it must produce an unphysiologic situation by blocking or at least retarding the normal elimination of intraocular fluid."

(Signed) K. W. Ascher, M.D.
Cincinnati, Ohio.

Specimens of Eyes

Editor,
American Journal of Ophthalmology:

The Committee on Ophthalmic Pathology of the American Academy of Ophthalmology and Otolaryngology announces that specimens of eyes will be received by the following institutions for processing:

Institution	Number of Additional Eyes Possible to Process Yearly
Baylor University Houston, Texas	100
Brooklyn Eye and Ear Hospital Brooklyn, New York	25
Cleveland Clinic Hospital Cleveland, Ohio	100
Cornell University Medical Center New York, New York	25
Doheny Laboratory St. Vincent's Hospital Los Angeles, California	120–150
Emory University Atlanta, Georgia	50
Episcopal Eye, Ear, Nose & Throat Hospital Washington, D.C.	75
Eye and Ear Hospital of Pittsburgh Pittsburgh, Pennsylvania	50–75
Grace-New Haven Community Hospital New Haven, Connecticut	25
Manhattan Eye, Ear and Throat Hospital New York, New York	25
Medical College of Virginia Richmond, Virginia	15
Montifiore Hospital New York, New York	50
Northwestern University Chicago, Illinois	50
Ohio State University Columbus, Ohio	100
St. Mary's Group of Hospitals Saint Louis, Missouri	80–100
Stanford University Medical Hospital San Francisco, California	200
Tulane University of Louisiana New Orleans, Louisiana	50
University of Alabama Birmingham, Alabama	50
University of California Department of Ophthalmology San Francisco, California	200
University of Cincinnati Cincinnati, Ohio	100
University of Colorado Denver, Colorado	50
University of Iowa Iowa City, Iowa	5
University of Kansas Kansas City, Kansas	50
University of Oklahoma Oklahoma City, Oklahoma	100
University of Oregon Portland, Oregon	50
University of Pennsylvania Hospital Philadelphia, Pennsylvania	50
Washington University Saint Louis, Missouri	75–100
Wayne University Kresge Foundation Detroit, Michigan	100

(Signed) Michael J. Hogan, *Chairman*
San Francisco, California.

BOOK REVIEWS

OPHTHALMOLOGY: A TEXTBOOK FOR DIPLOMA STUDENTS. By Patrick D. Trevor-Roper. Chicago, The Year Book Publishers, 1955. 637 pages, liberally illustrated, some pictures in color, index. Price: $15.00.

The author is curator, Department of Pathology of the Institute of Ophthalmology, London. He has given us a delightful and modern textbook, beautifully printed and illustrated. Although it is designed primarily as a book for the postgraduate student in ophthalmology who in Great Britain is preparing to take the examinations for a diploma in ophthalmic medicine and surgery, it should have a wide appeal in this country as well. The practicing ophthalmologist will find it to be a useful review of his subject, the residents can study it as they run, and the candidates for examinations of the American Board of Ophthalmology are sure to profit by its study. The hopes of the author that it will "provide an adequate basis for the practice of the ophthalmologist" are likely to be fulfilled.

In his acknowledgements, Trevor-Roper modestly says "my thanks are due first and in full measure to Sir Stewart Duke-Elder; this book was conceived with his advice, it was nurtured on the authority of his *Textbook*, and in reading a large section of the book in proof to remove the inaccurate, the trivial, and the obscure, he has rendered a service far greater than the book itself deserved."

Trevor-Roper writes very well indeed. You can see him fret over the necessity to be brief, austere, and didactic, but every once in a while "cheerfulness was always breaking in" particularly in some of the footnotes and small print. For example, in discussing the medical treatment of cataract, "it is not surprising that spurious cataract-cures abound on which an array of charlatans thrive" he adds this footnote (page 475) "The retinue of suggested medications tail off from the barely defensible (such as iodide—'removing sclerosed tissue') and the exuberant (such as whole embryo extract—'one of the endocrines is sure to work') to the unvarnished but at any rate economic deception of injections of sterile water."

The subject matters include the entire field of ophthalmology, from anatomy to zygoma. All of the chapters are good and some (for example, Optics, the Lens, the Retina) I think are outstanding. As in any book, there are statements to which exceptions can be made, but it is good that it does not bring "all things to all men" for in this way thought is engendered.

The book is strictly clinical in its approach. The author is obviously a good clinician of broad experience, who has removed rubbish that has accumulated and carried on from textbook to textbook in the past. In view of his position as curator in pathology, I would have liked to have seen more examples of histopathology tied in with the clinical descriptions. However, what is there is first class and there is no limit to what can be put into a book of this sort.

The illustrations, wisely chosen from many properly acknowledged sources, are well executed on glossy paper and show clearly what they are supposed to. The color plates, of which there are eight, are fine. The printing job, done in England, is most pleasing.

This new textbook is highly recommended, not for the undergraduate except as an accessory, but to the postgraduate and resident in ophthalmology.

Derrick Vail.

THE VISUAL FIELDS: A Study of the Applications of Quantitative Perimetry to the Anatomy and Pathology of the Visual Pathways. By Brodie Hughes. Springfield, Illinois, Charles C Thomas, 1955. Price: $7.25.

The author is Professor of Neurosurgery at the University of Birmingham, and hence the book lays most emphasis on disorders of the visual pathways and less on diseases of

the eye itself. The anatomy and blood supply of the visual pathways are fully covered. Quantitative perimetry as indicated in the title is the method stressed throughout the book, but the information to be gained from less exacting methods is not neglected. In discussion of controversial aspects of the anatomy of the visual pathways, the author adopts a common-sense middle-of-the-road point of view. The illustrations are plentiful and clearly reproduced, but I believe the value of the book might have been enhanced by the inclusion of more anatomic illustrations. The wide practical experience of the author adds authority to his statements. The book will prove of great value to all perimetrists, especially in the field of neurologic disorders. Ophthalmologists, neurologists, and neurosurgeons will thus all find it of practical value in everyday practice.

Paul A. Chandler.

Archives of the Ophthalmological Society of Northern Greece. Thessaloniki, Volume II, 1953. 168 pages.

The second volume of the society contains 24 reports. Polychronakos, Leanis, and Anastassiadis report their experience with the new miotic, mintacol (diethyl-p-nitrophenol phosphate), in 10 cases of chronic simple glaucoma. The reduction of intraocular pressure is equal to or better than that which follows the use of two percent pilocarpine. They recommended it in cases of allergic reaction to pilocarpine and in aphakic glaucoma. Polychronakos also reports a rare case of hemangioma of the lacrimal gland successfully removed by surgery.

Zervakakos presents a case of osteoma of the orbit and one of sympathetic ophthalmia treated successfully with streptomycin, aureomycin, and cortisone.

C. Konstas presents two cases of Duane's retraction syndrome and chronic dacryocystitis in females of three generations. He also reports in detail a case of Parinaud's syndrome in which the first ocular symptom was a paresis of the conjugate eye movements upward; gradually the patient developed papilledema, paralysis of convergence and accommodation, followed by miosis and secondary optic atrophy. No operation was done; the symptomatology suggests that the patient had a pineal tumor.

Georgiades, Petridis, and Kalaitzis report a case of thrombophlebitis of the cavernous sinus as a complication of acute dacryocystitis which was controlled with antibiotics. They also report an interesting and rare case of retinal detachment with an extensive dialysis and inversion of the retina in a 17-year-old boy with Marfan's syndrome. There was no history of injury. They also saw a case of Adamantiadis-Behçet's syndrome in a 14-year-old girl who, since the age of six years, had aphthous stomatitis and in the last three years recurrent ulcers of the external genitalia; later recurrent bilateral uveitis with hypopyon was noted. The same authors reported with Alexiades a case of generalized leprosy associated with interstitial keratitis and corneal anesthesia. Georgiades also reports a case of Sjøgren's syndrome, one of primary lipoid infiltration of the cornea and one of secondary tuberculosis of the conjunctiva.

A. Trantas reports interesting observations on certain entoptic phenomena and Karagounidis a case of localized myositis of the lateral rectus muscle simulating tumors of the sclera.

Adamantiadis gave a historic review of refractive errors and emphasized the contributions of Donders and Frangopoulos to the evolution of cataract surgery in the last 40 years. Tjanidis reports his observations of superficial cyclodiathermy and iridencleisis in the treatment of glaucoma. He is extremely conservative in advising surgery, if the glaucoma is controlled with miotics.

Raptis and Sapountzis report secondary glaucoma after spontaneous rupture of a cataractous lens which subsided after extraction of the lens. Charamis reviews the pathogenesis and treatment of central angiospastic

retinopathy in detail and reports six cases.

Brissimis reports his measurements of capillary fragility with the LaVollay capillodynamometer in 29 cases. Chilaris reports a rare case of sarcomatosis of Kaposi with involvement of the right upper lid.

This volume is well printed and illustrated and contains a brief summary in French.

Manos A. Petrohelos.

Office Procedures. By Paul Williamson, M.D., Philadelphia, W. B. Saunders Co., 1955. 412 pages, including index. Price: $12.50.

Williamson claims that the general practitioner should be able to detect and to some extent manage 90 percent of the pathologic conditions to which the eye is subject. His only special needs are an ophthalmoscope, binocular loupe, tetracaine, homatropine, pilocarpine, and fluorescein. Other equipment can be improvised. He illustrates how a paper clip can be turned into a lid retractor; and a small tongue blade, lubricated with petroleum jelly, substituted for a lid plate. He starts the ophthalmoscopic examination at 15 inches with +5.0D. in the aperture. If, on moving the head, the vessels move in the same direction, the eye has hyperopia; and vice versa. Opacities moving in the same direction are behind the iris; in the opposite direction, in front. In trichiasis offending lashes are removed by diathermy with the coagulating current. Meibomian secretion is expressed by the round end of a paper clip after everting the lid on a tongue blade. After incising a chalazion he scrapes the walls with the knife blade and wipes out the cheesy contents with a moistened applicator. In lid laceration only the skin is sutured, not the tarsus or conjunctiva.

The 15 sections of this vade mecum for the general practitioner cover every aspect of medical practice including roentgenography, physiotherapy, anesthesia, and psychologic testing. Clear figures profusely illustrate every point.

James E. Lebensohn.

Ageing: General Aspects. Volume I. G. E. W. Wolstenholme and Margaret P. Cameron, Editors for the Ciba Foundation, assisted by Joan Etherington. Boston, Little, Brown and Company, 1955. Clothbound, 255 pages, 38 illustrations. Price: $6.75.

This is a very readable record of the papers presented at the July 13 to 15, 1954, Ciba Foundation Colloquium on Ageing. The little book is made so much more entertaining by the publication of the exciting, informal discussions which followed each paper. Hormonal, vascular, dermatologic, nutritional, pathologic, and psychologic aspects of the ageing problem are described by distinguished experts from many countries and much unpublished material is made available. The very complex problems of ageing and its relationship to senescence and disease processes are discussed at length in a most provocative manner. Of particular interest to ophthalmologists are the delightful chapters and discussions on tissue transplants and preservation as they relate to and alter the ageing process.

Bernard Becker.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

1

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Chinaglia, V. **Biomicroscopic studies of the conjunctival lymphatics with dyes.** Ann. di ottal. e clin. ocul. **81**:325-348, Aug., 1955.

The conjunctival lymphatics of 60 normal subjects were studied with the biomicroscope by injecting trypan blue (0.5 to 1 percent) and brilliant kresyl blue (1/500) intraconjunctivally. A pericorneal zone in which the lymphatics form a fine network which terminates in loops at the corneal margin and a peripheral zone of grosser aspect can be distinguished. There seem to be anastomoses with the lymphatics of the palpebral conjunctiva, but none with those of the cornea. The lymph flow is directed away from the cornea. (12 figures, 44 references)

John J. Stern.

Copper, A. C. **The course of the nerve fibers in the retina.** Ophthalmologica **130**: 81-83, July, 1955.

This is a clinical contribution to the problem of the arrangement, with regard to depth, of the nerve fibers at the border of the disc. Observations on cases of juxtapapillary chorioretinitis point toward a deep location of the fibers from the retinal periphery. Peter C. Kronfeld.

François, J., Neetens, A., and Collette, J. M. **Vascular supply of the optic pathway. II. Further studies by micro-arteriography of the optic nerve.** Brit. J. Ophth. **39**:220-232, April, 1955.

The authors injected a special thorotrast solution into the small arteries by means of a fine cannula. Sections are made after immediate fixation in order to prevent diffusion out of the vessels. The technique of microradiography and the problems of photography of the histologic sections are described in detail. In this study transverse and horizontal slides were made of the optic nerve sections and the existence of two basic vascular patterns is established: 1. transverse, pentagonal loops encircling the single nerve bundles at regular distances and 2. longitudinal, running the length of the nerve between the bundles in the interfascicular spaces. Collateral vessels branch off from these two vascular units and anastomose extensively to form a complex capillary network with all vessels showing intimate anastomosis. In the optic nerve sheath

special vessels are noted which appear as fine cobweb-like formations and large irregular meshes. (15 figures, 17 references)
Lawrence L. Garner.

Kurus, Ernst. **A system of ganglion cells in the human choroid.** Klin. Monatsbl. f. Augenh. **127**:198-206, 1955.

It is possible that the intraocular pressure is regulated by a nervous system within the eye and there is indeed a complex nervous system present in the peripheral part of the choroid, the so-called "ciliary ganglion plexus" of Krause.

About 200 large ganglion cells of the Krause type could be found. They lie next to the branches of the ciliary nerves. In addition, there are groups of large polymorphous ganglion cells lying peripherally. Ganglion cells of medium and of smaller size could also be found. Receptor-like endplates were also present. (16 figures, 30 references)
Frederick C. Blodi.

Vrabec, Fr. **Relations between keratoblasts and nerve fiber regeneration in the cornea.** Ophthalmologica **130**:24-31, July, 1955.

The author has made a systematic histologic study of the corneal nerves, using silver impregnation as well as Dogiel's methylene blue staining method. In various diseases of the uvea with clinically normal corneas he finds "exuberant" hypertrophy of the nerve fibers in the corneal stroma. These newly-formed nerve fibers show a number of interesting morphologic characteristics which are described and illustrated by photomicrographs. These fibers are very closely and intimately associated with the keratoblasts and may, therefore, play an important part in their various functions. (4 figures, 15 references) Peter C. Kronfeld.

Wolter, J. Reimer. **The presence and importance of Bowman's canals in the cornea.** Klin. Monatsbl. f. Augenh. **127**: 193-197, 1955.

These canals could previously only be demonstrated after forceful injection of a liquid or a gas into the cornea. Rabbit's corneas were examined in flat sections after first injuring the cornea by a central incision. The sections were stained with silver carbonate. In some of the sections the infiltrating leukocytes lay in a long chain one after the other. It can be assumed that they immigrate along preformed channels and this is accepted as an indirect proof of the existence of Bowman's canals. These channels may enable the leukocytes to reach their goal faster in the area of infection. (2 figures, 11 references) Frederick C. Blodi.

2

GENERAL PATHOLOGY, BACTERIOLOGY, IMMUNOLOGY

de Andrade, Cesario. **Virus in ophthalmic pathology.** Rev. brasil. oftal. **14**:307-321, Sept., 1955.

The author gives a brief summary of the viruses of importance in ocular pathology and cites examples of the action of several viruses upon different tissues, producing different reactions. He points out that a virus may penetrate the eye and reach nerve centers, and he reviews the theories in which keratoconus and Devic's disease are attributed to infection by virus. Walter Mayer.

Brown, D. V. L., Cibis, P. A., and Pickering, J. E. **Radiation studies on the monkey eye.** A.M.A. Arch. Ophth. **54**: 249-256, Aug., 1955.

The retinal changes in 48 monkeys subjected to massive doses of Co^{60} gamma radiation were studied. Clinical manifestations consisted of severe iridocyclitis, retinal edema, papilledema, severe hypotony, and, in a few cases, punctate and flame-shaped retinal hemorrhages. His-

tologic abnormalities consisted chiefly of pyknosis of the rod nuclei (apparent as early as two hours after irradiation), and degenerative sequelae in the outer nuclear and bacillary layers. Both clinical and histologic alterations developed in a definite time pattern. (11 figures, 1 table, 7 references) G. S. Tyner.

Bruna, F. **Experimental ocular toxoplasmosis in the chick embryo (histopathologic reports).** Boll. d'ocul. **34**:333-360, June, 1955.

After inoculating fertile chicken eggs with a toxoplasmic suspension and then incubating these eggs until the embryos had partially developed, the author, on histopathological study, found that there was a hematogenous dissemination of the parasites with a particular affinity for highly vascularized tissues. As a result the uvea was most severely subjected to the direct action of the parasites. No parasites were found in the avascular retina. (13 figures, 2 tables, 40 references)
William C. Caccamise.

Garzino, Alessandro. **Collagen fibers in normal cornea and in cicatricial processes.** Rassegna ital. d'ottal. **24**:118-157, March-April, 1955.

Material for the study of many eyes was obtained from an eye bank, thus offering great variability in corneal changes. Collagenous fibers of the normal cornea appear to retain the characteristics of embryonal tissue so far as diameter and uniformity are concerned, whereas scleral fibers change considerably. Cement substance is much more abundant than in other tissues and is firmly adherent to the fibers. Variations of periodicity are common. In processes of cicatrization, the collagenous fibers are easily distinguishable from the normal by differences in diameter and periodicity as seen by the electronic microscope. The fibers may be three times the diameter of the normal, while the cement substance varies during healing but gradually decreases as the process of healing develops.

This rather long article is well illustrated with 35 figures and charts and presents a review of the published works on the subject to date. (35 figures, 13 references) Eugene M. Blake.

Gyllensten, L. J., and Hellstrom, E. E. **Experimental approach to the pathogenesis of retrolental fibroplasia. III. Changes in the eye induced by exposure of newborn mice to general hypoxia.** Brit. J. Ophth. **39**:409-415, July, 1955.

Newborn mice were exposed to 3-percent oxygen for three to ten hours a day for one to 22 days, after which the eyes were studied histologically. Hemorrhage from the retinal vessels into the fiber layer was found in 22 of 72 mice. There was also an apparent dilatation of arteries in the fiber layer but no vasoproliferative changes like those seen in human retrolental fibroplasia were found, although such changes have been oberved in mice exposed first to high concentrations of oxygen and subsequent stay in air. (2 figures, 1 table, 36 references)
Morris Kaplan.

Shikano, S. **The Arthus reaction of the anterior chamber of the eye.** Acta Soc. Ophth. Japan **59**:1111-1121, Aug., 1955.

Rabbits were sensitized with white of egg. After a certain period of time the precipitation reaction of serum against the same antigen became positive. Nevertheless, precipitation antibodies were not demonstrated in the aqueous, even with the highest titer of the antibodies in the serum. However, when the same antigen was introduced into the aqueous of sensitized rabbits, a severe Arthus reaction was brought about within several hours. The reaction at first occurred at the limbus, then in the iris and finally in the ciliary body. In sensitized animals the

antigen disappeared in the course of 10 to 24 hours after its introduction into the aqueous with an appearance of Arthus reaction. There was a later appearance of antibodies in the aqueous. In control animals, antigen introduced into the aqueous was demonstrable in there for as long as several days, and the reactive inflammation was minimal. Shikano also found that an injection into the aqueous of such a different antigen as coli caused a rapid appearance of antibodies against egg white in the aqueous of sensitized rabbits. From these results he discusses the diagnostic value of Middlebrook-Dubos and similar reactions of the aqueous humor. (9 figures, 2 tables, 14 references) Yukihiko Mitsui.

3

VEGETATIVE PHYSIOLOGY, BIOCHEMISTRY, PHARMACOLOGY, TOXICOLOGY

Ambrosio, Andrea. **The permeability and the water content of the cornea in the course of uveal inflammations.** Arch. di ottal. **59**:37-48, Jan.-Feb., 1955.

In 13 rabbits uveal inflammation was produced in one eye by injecting 0.1 cc. of horse serum into the vitreous and 20 days later injecting intravenously 10 cc. of horse serum. Fluoresceine injected into the anterior chamber was observed to penetrate the cornea at a faster rate in the inflamed eye, and the water content of the cornea in those eyes was 7 to 18 percent higher than in the control eyes. (2 figures, 2 tables, 40 references)

J. J. Stern.

Aoki, H., and Aoki, Y. **Experimental studies on the function of the lacrimal gland. Report I.** Acta Soc. Ophth. Japan **59**:970-974, July, 1955. Kaku, K. **Report II.** Ibid. **59**:975-979, Aug., 1955.

These two reports are two parts of the same experiments suggesting an endocrine function of the lacrimal glands. Aoki and Aoki removed lacrimal glands in young dogs. A hyperfunction of the thyroid gland and a proliferation of α-cells and an atrophy of β-cells in the pituitary resulted. Kaku did the same in young rats. A hyperfunction of the thyroid and anterior pituitary gland as well as an atrophy of the symphyses of bones appeared after one month. (20 figures, 2 tables, 6 references) Yukihiko Mitsui.

Belfort Mattos, R., and Pereira Gomes, J. **Hyaluronidase in ophthalmology.** Arq. brasil. de oftal. **17**:27-38, 1954.

Hyaluronidase is an enzyme which acts mainly by depolymerization of hyaluronic acid, a basal cement substance in connective tissue. This results in greater permeability of the connective tissue. A secondary action—a modified permeability of vessel walls—may be due to the presence of histamine. This action has two indications in ophthalmology, as an adjuvant in local anesthesia and in therapy. In the former, its value has been well described by Atkinson and Key. When added to the anesthetic agent, it promotes rapid diffusion and minimizes edema, thus allowing the use of smaller quantities while producing better anesthesia.

In therapy, it results in a temporary reduction of intraocular pressure when injected retrobulbarly, an important feature in minimizing loss of vitreous in cataract extraction. In addition, it has been observed to facilitate the penetration of some drugs, and to speed the absorption of vitreous opacities, ecchymoses of the lids, hyphema and subconjunctival hemorrhage. It has also been used in the treatment of pterygium, exophthalmos and episcleritis.

No signs of toxicity or allergy have been observed. Because of the spreading factor, its use in inflammatory conditions should be avoided. (28 references)

James W. Brennan.

Bleeker, G. M., and Maas, E. R. **The penetration of aureomycin, terramycin and chloramphenicol into the ocular tissues.** Ophthalmologic **130**:1-8, July, 1955.

This study of the penetration of antibiotics into the eyes of normal rabbits brings out the "spectacular" superiority of chloramphenicol in situations where effective antibiotic concentration in the inner eye can be obtained only by systemic administration. Because of its high liquid solubility, chloramphenicol passes the blood-aqueous more easily than aureomycin and terramycin. In man effective concentrations of chloramphenicol in the uvea and even in the vitreous may be attained and maintained by an initial dose of 1 gm. followed by 500 mg. every six hours. Under conditions of topical administration the three antibiotics tested penetrate fairly and equally well into the cornea. None of them is really suitable for subconjunctival administration in man. (13 figures, 7 references)

Peter C. Kronfeld.

Boyd, T. A. S. **Influence of local ascorbic acid concentration on collagenous tissue healing in the cornea.** Brit. J. Ophth. **39**:204-214, April, 1955.

The results of this study corroborate previous work showing the beneficial effects of ascorbic acid on tissue healing. The lenses were removed from the left eye of a series of guinea pigs and the diet provided for a high intake of ascorbic acid. Standardized heat injuries were then applied to both corneas and the healing rate noted. The corneas of aphakic eyes required 40 percent more time for healing and tests for ascorbic acid content in these corneas revealed a significantly lowered content. The presence of the lens is of obvious value in corneal metabolism. (1 figure, 5 tables, 33 references)

Lawrence L. Garner.

Gandolfi, A., and Montaldi, M. **The possibility of eliminating the anti-epithelializing effect of hydrocortisone through the use of chlorophyll.** Arch. di ottal. **59**: 5-12, Jan.-Feb., 1955.

Eighteen rabbits were used in three groups: one eye in each rabbit was used as control; in the other eye a corneal abrasion was produced. In the first group 1-percent hydrocortisone ointment was put into one eye every three hours; in the second group 1-percent chlorophyll together with hydrocortisone. In the third group hydrocortisone alone was given in one eye, and associated with chlorophyll in the other eye. A significant difference was found. Untreated eyes recovered in 180 hours (±6.72). Eyes treated with hydrocortisone healed only in 274 hours (±6.72). Those treated with a combination of hydrocortisone and chlorophyll healed in 182 hours (±6.0). It is concluded that hydrocortisone definitely retards the rate of re-epithelization and that chlorophyll counteracts effectively this undesirable effect. (2 tables, 12 references)

John J. Stern.

Gemolotto, Guglielmo. **Histochemical investigation of the mucopolysaccharides of the cornea in experimental keratitis.** Arch. di ottal. **59**:185-190, May-June, 1955.

After sectioning the ciliary vessels and nerves and the optic nerve in rabbits, a keratitis was observed to develop within four days. In all six eyes a diminution of the corneal mucopolysaccharides, compared with the control eye, was observed. (2 figures, 8 references)

John J. Stern.

Grant, W. Morton. **Facility of flow through the trabecular meshwork.** A.M.A. Arch. Ophth. **54**:245-248, Aug., 1955.

In this investigation the author has attempted to evaluate the role of the corneoscleral meshwork as an anatomic factor

in resistance to aqueous flow. The method of study is described. Grant concludes that the trabecular meshwork offers little resistance to aqueous outflow, but that the principal resistance is probably in the immediate outlets from Schlemm's canal. The conclusions are made with certain reservations because studies were carried out on enucleated eyes. (4 figures, 1 table, 7 references) G. S. Tyner.

Harris, John E. **Pharmacology and toxicology.** A.M.A. Arch. Ophth. **54**:262-299, Aug., 1955.

The pertinent literature for the year is reviewed. It was noted that relatively few new developments occurred in this field. (430 references) G. S. Tyner.

Morawiecki, J. **The antiallergic effect of riboflavin.** Ophthalmologica **129**:396-399, June, 1955.

Systemic administration of riboflavin has been found beneficial in vernal catarrh and phlyctenular disease (cfr. Am. J. Ophth. 31:1619, 1948 and 32:1553, 1949). From observations in other allergic diseases and in experimentally produced anaphylactic shock, riboflavin has come to be considered an antihistaminic. In the hands of the author of this paper topically applied ribroflavin failed to influence anaphylactic and bacterial hypersensitivity reactions such as the Mantoux test. The author suggests that the beneficial effects of riboflavin in allergic corneal diseases are due to improved corneal metabolism rather than any antihistaminic action. (10 references) Peter C. Kronfeld.

Pau, H. **Double refraction of ocular tissues.** Klin. Monatsbl. f. Augenh. **127**:190-193, 1955.

It has been shown repeatedly that the sclera and the cornea display double refraction. But this property is also present in muscle tissues, tendons, the dura mater, and to a lesser degree in the corneal and conjunctival epithelium, Descemet's membrane, zonular fibers and lens capsule. This property develops during early fetal life and is lost in many pathologic conditions. (5 figures, 3 references).

Frederick C. Blodi.

Perkins, E. S. **Pressure in the canal of Schlemm.** Brit. J. Ophth. **39**:215-219, April, 1955.

The author attempted direct measurement of the pressure relationship of the canal of Schlemm and the anterior chamber. He used the living normal eyes of Rhesus monkeys. The technical difficulties encountered in trying to pass a cannula into the very small canal were great. The few eyes studied indicate that pressure in the canal of Schlemm is approximately 10 percent lower than that in the anterior chamber. (1 figure, 3 tables, 7 references) Lawrence L. Garner.

Radnót, M., and Németh, B. **The effect of testosterone upon the lacrimal gland.** Ophthalmologica **129**:376-380, June, 1955.

In search of an experimental basis for the beneficial effect of sex hormones in keratoconjunctivitis sicca the authors administered male sex hormone to female and castrated male rabbits for 8 to 12 weeks. At the end of that period the animals were killed, their lacrimal glands dissected out, weighed and examined histologically. The lacrimal glands of animals that had received 500 mg. or more of testosterone were found to be two to three times as large as those of control animals. Histologically, the glands of the treated animals showed signs of increased secretory activity. (8 tables, 5 references)

Peter C. Kronfeld.

Recupero, C. **Studies of serum proteins by paper electrophoresis in spring catarrh and phlyctenular keratoconjunctivitis.** Arch. di ottal. **59**:199-210, May-June, 1955.

In ten subjects with spring catarrh there was hypoproteinemia, hypoalbuminemia, a normal alpha-globulin level and a raise of gamma globulin in 55 percent of the cases. The findings correspond with those in other allergic conditions. In seven patients with phlyctenular disease the author found hypoalbuminemia, increased alpha-2-globulin and gamma globulin, occasional increase of beta-globulin and normal alpha-1-globulin. These findings are similar to those in tuberculous disease; in all cases there were specific pulmonary lesions, the tuberculin reactions were positive and the Katz index elevated. (2 tables, 11 references)

John J. Stern.

deRosa, Luigi. **The presence of phosphorus in the vitreous in experimental pigmentary retinal degeneration.** Rassegna ital. d'ottal. **24**:114-117, March-April, 1955.

DeRosa reviews the various chemical changes in the ocular tissues and fluids which have been found by other research workers in experimental retinal pigmentary degeneration. Rabbits were injected on alternate days with a 2 cc. solution of 45-percent iodate of soda. Characteristic changes of the fundus developed in 15 days. The vitreous close to the ciliary processes and that nearest the posterior portion of the retina were studied particularly. The results showed that the percentage of inorganic phosphorus was greatest close to the posterior retina and was maximal in the period immediately after the appearance of retinal changes. This represents an increased permeability of the hemato-ophthalmic barrier. (3 tables, 10 references) Eugene M. Blake.

Siliato, Francesco. **The influence of light on the elimination of the 17-ketosterones (experimental studies).** Ann. di ottal e clin. ocul. **81**:367-374, Sept., 1955.

The author studied the elimination of keto-sterones in eight rabbits which were exposed to either normal diurnal variations between light and darkness, or kept in either a constantly lighted environment or in constant darkness for 48 hours. Under the light stimulus a definite increase in the elimination of the hormones in the urine was observed. These findings favor a hypothesis of a "photogonado-corticotrope" reflex. (1 figure, 1 table, 28 references) John J. Stern.

Staenglen, K. **Treatment of retinal hyperemia with a new drug.** Deutsche med. Wchnschr. **80**:1239-1244, Sept. 2, 1955.

Neprosol is the methane sulfonate of 1,4-dihydrazinophthalazin and is valuable because it acts centrally as well as peripherally. It has been used chiefly in arterial hypertension, but this study shows that it is also valuable in bringing about hyperemia in the retina. (10 figures, 11 references) F. H. Haessler.

Storm, O. **Fibrinolytic activity in human tears.** Scandinav. J. Cl. & Lab. Invest. **7**:55-58, Jan. 1955.

Because human milk, blood and urine have been shown to possess a fibrinolytic activity, experiments were done to demonstrate the same in normal human tears. Tears were found to contain a small amount of proactivator. The use of streptokinase unmasked a large amount of activator, which was capable of producing fibrinolysis by converting plasminogen to plasmin. This activator resembled that found in milk more than that in urine. It is postulated that the fibrinolytic activator produces a rapid resolution of clotted fibrin in the excretory and lacrimal ducts, thus assuring their patency. (3 figures, 6 references) Harry Horwich.

Tojo, H. **Developmental mechanism of galactose cataract.** Acta Soc. Ophth. Japan **59**:933-939, July, 1955.

This is a study to clarify the develop-

mental mechanism of galactose cataract. When scorbutic guinea pigs are given a diet containing two-percent galactose, there is no development of cataract. However, when 500 mg. tyrosine is added to the daily diet, there is a development of cataract. In the urine of such animals homogentisic acid and benzoquinone acetic acid are excreted. The ingestion of tyrosine alone or with glucose does not result in a cataract development. Tojo suggests that the metabolism of an amino acid such as tyrosine plays a part in the development of so-called galactose cataract. (1 figure, 6 tables, 21 references)

Yukihiko Mitsui.

Vannini, A., and Borello, C. **Components of coagulation in the tissues and fluids of the eye.** Rassegna ital. d'ottal. **24**:81-113, March-April, 1955.

The writers have observed that vitreous and aqueous extracts of the cornea possess thrombloplastic activity. Aqueous removed during life takes part in the formation of a complex prothrombin substance. Since one is not always able to grasp the conception of what occurs in the pathologic changes in the eye it is possible in research to produce a clearer picture. The experimenters in this study removed and mixed blood and aqueous from their animals and timed the process of coagulation. Vessels containing silicon appear to have imitated the conditions in life more nearly than other glass vessels. The technique employed was to remove 0.15 cc. of aqueous from the anterior chamber and blood from the ear of rabbits and refrigerate the mixture for five hours. Coagulation time was much shortened. The same was true when vitreous was mixed with blood. Blood alone was slower in coagulating. The facts observed in these experiments are a confirmation of what is known in human pathology of the eye. (1 graph, 9 tables, 35 references) Eugene M. Blake.

Velter, E., Desvignes, P., and Le-Van-Nham. **Study of the retinal respiration by the method of Warburg.** Arch. d'opht. **15**:469-473, 1955.

In a study of the retinal respiration of beef eyes by the manometric method of Warburg, the authors found that the retina consumed less oxygen in daylight than in darkness, and that this difference could vary from 10 to 20 percent according to the nature of the fluid used in the test. In colored light the respiration increased from red to blue but it changed very little in passing from yellow to green. The authors point out that the fact that the retina respires more in the dark than in daylight does not mean that the rods consume more oxygen than the cones and offer an explanation for this interpretation. They suggest further that it would be interesting to study the oxygen consumption of the retina in ultraviolet and infrared light. (5 tables)

P. Thygeson.

de Vincentiis, Mario. **Recent experimental work on the content of pyruvic acid and lactic acid in the vitreous.** Arch. di ottal. **59**:49-55, Jan.-Feb., 1955.

Continuing the series of experiments concerning the behavior of certain metabolites in the intraocular fluids, the author found that diathermocoagulation of the sclera and section of the optic nerve in rabbits result in a lowering of the pyruvic acid and lactic acid content of the vitreous. This demonstrates destruction of the retina after diathermy and degeneration of the ganglion cell layer after section of the optic nerve. (1 table, 14 references) John J. Stern.

Wiesinger, H., Kaunitz, H., and Slanetz, C. **Corneal changes due to riboflavin deficiency in rats.** Ophthalmologica **129**:389-395, June, 1955.

This study concerns itself with super-

ficial corneal vascularization in rats fed deficient diets. Protein deficiency alone and riboflavin deficiency alone cause corneal vascularization. High protein intake delays but does not prevent the vascularization due to riboflavin deficiency. The rate of development of the corneal vessels is also dependent upon the type and amount of fat in the diet. (2 figures, 2 tables, 11 references) Peter C. Kronfeld.

4

PHYSIOLOGIC OPTICS, REFRACTION, COLOR VISION

Io Cascio, G. **Characteristics of the dioptrics in pupillary decentration.** Boll. d'ocul. **34**:321-332, June, 1955.

The author discusses the results of decentration of the optic center of the pupil in respect to both the anatomic center and the optic zone. (11 references)

William C. Caccamise.

Cucco, G. **The influence of the magnification and focusing of the retinal image on the visual acuity of hypermetropes. Studies in physiological optics.** Ann. di ottal. e clin. ocul. **81**:403-410, Sept., 1955.

Increasing the distance of a convex lens from the cornea can improve vision and may be useful in correcting hypermetropic amblyopia. This observation has been subjected to a mathematical analysis and it was found that the method cannot be used beyond a certain limit because an increase in the size of the retinal image is accompanied by an increase in size of the circles of confusion. (4 references)

John J. Stern.

Ehrich, Wulf. **The difficulty of separation in amblyopic eyes and its treatment.** Klin. Monatsbl. f. Augenh. **127**:221-224, 1955.

Amblyopic children often have difficulty in separating and distinguishing many letters in one row and the acuity taken in such a manner may be much poorer than when only a single letter is presented. This faculty of separation is a higher macular function and can be trained in these children with targets that contain numerous letters "E" at various distances from one another. (3 figures, 3 references)

Frederick C. Blodi.

Engelbrecht, Kurt. **The true simultaneous contrast phenomenon and false increases in contrast.** Klin. Monatsbl. f. Augenh. **127**:163-168, 1955.

A true simultaneous contrast phenomenon can only be obtained in normal persons. In deuteranopes or protanopes this contrast phenomenon elicits the confusion color. (5 references)

Frederick C. Blodi.

Fabre, Philippe. **Topographic ophthalmometry. I. Necessity for the study of refraction in all parts of the pupil in subjects with normal acuity.** Arch. d'opht. **15**:245-257, 1955.

The author discusses the role of peripheral parts of the pupil in image formation and refers particularly to the findings of A. Ivanoff (1953) which support the view that such areas play an important part in determining the position of the image and its degree of definition. Fabre then analyzes the different known test methods and describes a method of topographic ophthalmometry with a new instrument of his design which allows a rapid dioptric assay of the pupillary area. He concludes that it is the lens, rather than the cornea, which is responsible for variations. The importance of topographic analysis as related to the prescribing of glasses is discussed. (11 figures, 7 references)

P. Thygeson.

Fender, D. H. **Variation of fixation direction with colour of fixation target.** Brit. J. Ophth. **39**:294-297, May, 1955.

During field of vision studies it frequently is noted that the direction of fixation of the eye changes with changes in color of the test objects. This movement can be easily noted if a contact lens bearing a reflecting mirror on its surface is worn. In 1947 Hartridge explained this phenomenon by the cluster theory of receptors sensitive to various colors in the acceptance of which one assumes that the visual axis of the eye must shift to align the cluster of receptors sensitive to the color being looked at. Fender advances another theory in explanation of this phenomenon; the state of accommodation of the eye changes with color of the target, thus producing a shift of the back nodal point of the eye; since the visual axis is inclined to the optic axis, this movement of the nodal point will produce a lateral shift of the image on the retina. The eye then must rotate to maintain the image of the target on the same point of the retina whatever the color of the target. (3 figures, 1 table, 3 references)

Morris Kaplan.

François, J., Verriest, G., and De Rouck, A. **Modification of the amplitude of the human electro-oculogram by light and dark adaptation.** Brit. J. Ophth. **39**:398-408, July, 1955.

The Goldmann-Weekers adaptometer was used and tracings made in three different leads are reproduced from each subject. It was found that light adaptation results in a decrease and dark adaptations in an increase of amplitude of electrical impulses. (7 figures, 4 tables, 4 references)

Morris Kaplan.

Graff, Th. **Systematic errors in retinoscopy.** Klin. Monatsbl. f. Augenh. **127**: 168-174, 1955.

In order to calculate the actual vertex refraction of the glasses in the trial frame, the dioptric value of the distance of the examiner's pupil from the trial lens is substracted. This is only correct when the lenses are of minimal thickness. In thick lenses a correction quotient has to be considered. Curves and monograms were calculated by the author to find these quotients for various dioptric values. (2 charts, 3 references)

Frederick C. Blodi.

Hioki, R., and Nakamura, Y. **The polaroid anomaloscope of Hioki.** Arch. d'opht. **15**:258-262, 1955.

The authors consider that up to the present time the anomaloscope of Nagel has been the most precise instrument for the examination of color vision. The anomaloscope of Hioki is an improvement of Nagel's Type II anomaloscope and the two instruments are compared in detail and a chart used to summarize the essential differences. (2 figures, 1 table)

P. Thygeson.

Klecker, Wilhelm. **Change in refraction after a squint operation.** Klin. Monatsbl. f. Augenh. **127**:224-226, 1955.

A 12-year-old girl had a compound hyperopic astigmatism and esotropia. A bilateral advancement was performed and the astigmatism was temporarily changed and decreased. (1 table, 3 references)

Frederick C. Blodi.

Lopes de Faria, Natalicio. **Visio, a new unit of visual acuity.** Rev. brasil. oftal. **14**:371-374, Sept., 1955.

The author advocates the establishment of a new concept, the visio, which is the unit that expresses the visual acuity necessary to satisfy production. It corresponds to a Snellen notation of 4/10 or better in at least one of the eyes, corrected or uncorrected. This is coefficient 1; coefficient 2 expresses half the visual acuity expressed by the unit visio and so forth.

By establishing three different grades,

the author, with the help of his visiometer, had examined school children in Brazil in an effective way and he believes that this new unit opens new horizons for the medicolegal practice of ophthalmology.

Walter Mayer.

Marconcini, Eraldo. **A case of high hypermetropia.** Arch. di ottal. **59**:191-198, May-June, 1955.

The author describes a 10-year-old child, a dwarf with polydactylism and a hypermetropia of +18 in one eye and +20 in the other. No significant findings were noted in the family. An extensive discussion follows. (17 references) John J. Stern.

Mitchell, A. M., and Ellerbrock, V. J. **Fixation disparity and the maintenance of fusion in the horizontal meridian.** Am. J. Optometry **32**:520-534, Oct., 1955.

Fusion is not only possible for corresponding points, but also for points within Panum's areas. Fixation disparity is a measure of the deviation of the foveal line, while fusion tends to fix the eye position. It is measured with and without forced divergence and convergence. A new instrument of high precision is described for this purpose. Results show a great change in the fixation disparity curves when forced vergence is maintained for 15 or more minutes. Fixation disparity would likely have more clinical value than the more simple tests of phoria.

Paul W. Miles.

Monje, Manfred. **The examination of refraction and muscle balance with the proximeter.** Klin. Monatsbl. f. Augenh. **127**:226-228, 1955.

The proximeter is an instrument that allows the measurement of the near point of accommodation and of the convergence. With it one also tests near vision. The new attachment is an opaque plate which separates the images presented to each eye. In this way a slight difference in visual acuity or a heterophoria can easily be tested. (4 references)

Frederick C. Blodi.

Salleras, Alejandro. **Correction of large ametropias and anisometropias through acrylic lenses in the anterior chamber. A follow-up study.** Arch. oftal. Buenos Aires **30**:187-188, May, 1955.

This paper refers to the end results obtained in four patients submitted to Strampelli's operation in order to correct a large, unilateral refractive error. These cases, which were already presented when at an earlier stage (cf. Arch. oftal. Buenos Aires 30:43, 1955), have been dealt with to some extent in a previous issue of this journal. In none of them did the lens give rise to a lasting iridociliary reaction or to a rise in tension. In all vision was much improved, amounting to 20/50 with −4.00D. cyl., ax. 180°, in the first one, to 20/20 with +0.50D. sph. in the second, to 20/20 with +2.00D. sph. in the third, and to 20/30 with −4.00D. cyl. ax. 180°, in the fourth. Still, no information is given as to the eventual recovery of binocular vision.

A. Urrets-Zavalia, Jr.

Schober, Herbert. **The accuracy of objective and subjective refracting methods.** Klin. Monatsbl. f. Augenh. **127**:182-189, 1955.

196 eyes of 100 patients were refracted according to a subjective method and an objective method (refractometer of Rodenstock or Thorner, the coincidence refractometer of Hartinger). The results did usually compare very well and the differences rarely exceeded one-half diopter especially when an adjustment is made for the residual accommodation in patients below 40 years of age. The author emphasizes that the objective methods are faster and the results are more reliable. (2 tables, 7 references) Frederick C. Blodi.

Toselli, C., and Andriana, D. **Refraction and phoria (a study of pseudoheterophoria).** Ann. di. ottal. e clin. ocul. **81**:319-324, Aug., 1955.

After review of the literature the author reports that the refraction exerted a definite influence on the muscular equilibrium in 500 of his ametropic cases. In 20 percent, the heterophoria was corrected by glasses. (31 references) John J. Stern.

Toselli, C., and Andreani, D. **Accommodation and phoria (studies of muscular equilibrium in presbyopia and cyclospastic pseudomyopia).** Ann di. ottal e clin. ocul. **81**:383-388, Sept., 1955.

The use of lenses aggravates exophoria for near vision in presbyopes; in spontaneous or experimental ciliary spasm exophoria can be observed and is probably due to a disturbance of the relation between accommodation and accommoda tive convergence. (2 tables, 21 references) John J. Stern.

Watanabe, T. **Electroencephalogram induced by flicker illumination.** Acta Soc. Ophth. Japan **59**:873-889, July, 1955.

This is a clinical application of Adrian's contribution (Lancet, 1943) on the corresponding vibration of electroencephalograms, with flickering illumination. By organic changes in the visual paths, the vibration is impeded. In visual disturbances due to changes outside of the paths, the vibration is not obviously impeded. With functional visual disturbance, the vibration remains normal.

The flicker illumination not only induces a corresponding vibration but it also impedes the alpha-wave of the normal encephalogram. When the organic lesion in the visual paths lies in the periphery of the corpus geniculatum laterale, alpha-wave impedance occurs indistinctly. When the lesion is in the Gratiolet's radiation or in the cortex, the impedance occurs distinctly. Watanabe concludes that a measurement of the electroencephalogram induced by flicker illumination is of value in the diagnosis of visual disturbance, particularly as to the site and sort of lesion. (8 figures, 1 table, 13 references) Yukihiko Mitsui.

Weigelin, E., Heinrichs, H. Leonardi, F., and Nieseg, P. **The relation between subjective visual acuity and the results of an objective examination.** Klin. Monatsbl. f. Augenh. **127**:174-181, 1955.

The objective examination of the visual acuity was performed by utilizing the optokinetic nystagmus (Ohm). The illumination of the targets can be changed (Romberg). 212 eyes were tested. There was generally a good correlation between the subjectively determined acuity and the results of the objective examination. In patients with severe field defects the optokinetic nystagmus may be suppressed. The absence of this nystagmus does not necessarily mean that the acuity is extremely low. (2 figure, 1 table, 6 references) Frederick C. Blodi.

Weymouth, Frank W. **Visual acuity—an analysis of the stimulus situation.** Am. J. Optometry **32**:507-519, Oct., 1955.

Vision is a sluggish sense compared to hearing and time allowed for testing is important. While vision depends on the illumination level, contrast is much more important than absolute retinal luminance. No retinal image has a sharp edge, but an edge gradient. The contour line depends on adaptation. A visual stimulus and response is not repeatable unless time, contrast, visual angle and adaptation level are controlled; such terms as minimum visible and minimum separable are for this reason obsolete. Paul W. Miles.

Wray, Arene T. **Clinical report of the correction of aniseikonia in cases of low**

refractive error. Am. J. Optometry **32**:535-539, Oct., 1955.

Three case reports are presented of patients with low degrees of ametropia who complained of headache with or without glasses. When aniseikonia was measured, it did not conform to any difference in refractive correction of the two eyes, but the type was meridional. Correction in glasses of the aniseikonia in each case produced gratifying results to relieve headache and eye strain. Paul W. Miles.

5

DIAGNOSIS AND THERAPY

Amsler, M., and Huber, A. **Nine years' experiences with the fluorescein test.** Ophthalmologica **129**:271-275, April-May, 1955.

The authors' fluorescein test concerns itself with the rate of fluorescein accumulation in the anterior chamber after intravenous injection of the dye. This rate is considered to depend primarily upon the permeability of the blood-aqueous barrier. The test has found wide acceptance. The paper under review deals specifically with the effects of drugs upon the permeability of the blood-aqueous barrier. (46 references) Peter C. Kronfeld.

de Anquín, M. H., and Copello, M. D. **Cholesterol crystals in the aqueous humor.** Arch. oftal. Buenos Aires **30**:189-196, May, 1955.

A 56-year-old woman, who at the age of 12 years had suffered a contusion on the right eye, presented on examination a violent iridociliary reaction in the affected eye. A large number of shining golden particles were seen in the anterior chamber, in the bottom of which they had collected into a triangular, whitish mass; the iris had lost its normal structure and the pupil adhered by many posterior synechiae to a cataractous, partly resorbed lens. Vision was reduced to little more than light perception. The ocular tension was 11 mm. Hg. The eye was tapped and some aqueous withdrawn, which, when submitted to a qualitative test for cholesterol, yielded an intensely positive result. All clinical and laboratory investigations were negative, including those for plasma cholesterol, which were within normal limits.

As the finding of glittering cholesterol crystals is not at all rare in traumatic, complicated and senile hypermature cataracts, and as, in the case here reported, a posttraumatic atrophy of the lens had taken place, with, in all probability, a gushing of its content into the anterior chamber, the presence of such crystals may be regarded as resulting from a merely local, rather than systemic disturbance (4 figures, 6 references)

A. Urrets-Zavalía, Jr.

Barraquer, Joaquin. **Potentiation of drug actions in ocular surgery.** Ophthalmologica **129**:400-404, June, 1955.

Some of the combinations of drugs used by the ophthalmic surgeon represent instances of potentiation, that is, greater pharmacologic action than that which can be anticipated from the sum of their individual actions. The author's routine premedication for intraocular surgery is given in detail. In the preoperative sedative he includes 50 mg. of thorazine. Curare is used routinely during all cataract operations. Out of a syringe containing 10 mg. of curare 1 mg. is injected per minute until a satisfactory state of relaxation of the extraocular muscles is achieved. Needle and syringe are kept in place so as to be able to augment or prolong the muscular relaxation in accordance with the needs of the surgeon. Oxygen by the open method is also used routinely during cataract surgery. Barbiturates and thorazine are continued for 5 to 6 days postoperatively.

Peter C. Kronfeld.

Bellavia, M., and Caselli, F. **Ophthaine, a new surface anesthetic in ophthalmology.** Arch. di ottal. **59**:57-61, Jan.-Feb., 1955.

In 60 patients it was shown that ophthaine has the following advantages, compared to other surface anesthetics: it acts faster; its action is more intense; irritation is absent; the corneal epithelium is not disturbed even after several instillations; and there is no mydriatic or cycloplegic effect. No direct comparison was made with other anesthetics. (1 reference)

J. J. Stern.

Bonnet, Paul. **The cavernous space and the syndromes of the cavernous space.** Arch. d'opht. **15**:357-372, 1955.

The author prefers the term "cavernous space" (la loge caverneuse) to the commonly used "cavernous sinus," which he feels has led to errors of interpretation. He reviews in detail the anatomy of this space and refers to a number of errors which have appeared in anatomy texts. He describes the cavernous sinus as a plexus of anastomosing veins lying free in the cavernous space whose wall is nondistensible. His descriptions are supplemented by five drawings in black and white.

The author mentions six syndromes that involve this space; namely, 1. the syndrome of the sphenoidal fissure, 2. the syndrome of the orbital apex, 3. the syndrome of the external wall of the cavernous sinus, 4. the sphenopetrosal syndrome, 5. the syndrome of the petrosphenoidal crossways, and finally 6. the syndrome of the anterior torn hole (trou déchiré antérieur). He feels, however, that they should all be grouped under the name "syndrome of the cavernous space." In this syndrome there is involvement, simultaneously or successively, of the organs enclosed in the space, including the carotid artery, the gasserian ganglion and its branches, the oculomotor nerves, and the veins of the cavernous sinus. Bonnet then describes the signs and symptoms of anterior, middle, and posterior involvement of the space. (5 figures)

P. Thygeson.

Bonnet, P., and Bret, P. Y. **Tomography of the intracranial carotid.** Arch. d'opht. **14**:775-786, 1954.

The authors note that tomography of the intracranial carotid has special interest for ophthalmologists in their efforts to detect calcifications of the arterial wall characteristic of atherosclerosis. After a preliminary review of the topographic anatomy of the normal carotid, they summarize the present indications for and knowledge derived from this method of radiography. They stress that the arch of the carotid at the base of the clinoid is the most important portion for study. They conclude that the method is indicated in the following cases: 1. any case of sudden unexplained visual loss, with mydriasis of the blind eye and absence of the photomotor reflex but conservation of the consensual reflex; and 2. any case of unilateral atrophy of the optic nerve if the cause is otherwise not evident. It is of particular value when arteriography would be considered dangerous. (12 figures)

P. Thygeson.

Cascio, Girolamo L. **The number of vessels on the optic disc (capillary test of Kestenbaum) in pigment degeneration of the retina.** Arch. di ottal. **59**:63-70, Jan.-Feb., 1955.

In 16 cases of pigment degeneration of the retina, it was found that during the development of the disease the capillary index of Kestenbaum is always reduced; there is, however, no direct relation between the loss of vision and the number of capillaries. (1 table, 5 references)

John J. Stern.

Cowie, J. W., and Groves, J. S. **Preliminary report on the use of contrast**

media in orbital radiography. Brit. J. Ophth. **39**:283-293, May, 1955.

Water-soluble media, particularly diodone are the most satisfactory since good contrast with no irritation is obtained. The medium is injected through the tissues very easily and is absorbed without difficulty within 10 minutes. It is easily injected into the muscle cone in any one of the quadrants and films are taken on the ordinary portable unit. The medium is used in 17-percent solution in novocaine and is injected in amounts of 1.5 to 2 cc. It is used in localization of foreign bodies within the eyeball as well as within the orbit and for investigation of space-occupying lesions in the orbit. There seem to be no risks and no disadvantages to the use of 17-percent diodone. (10 figures, 18 references) Morris Kaplan.

Fincham, E. F. **Photographic recording of opacities of the ocular media.** Brit. J. Ophth. **39**:85-89, Feb., 1955.

The author has adapted a simple system of lighting and observation and applied this to a slitlamp. Transillumination is obtained by light reflected from the fundus and affords the advantage of revealing the entire pupillary aperture with almost uniform lighting. The efficiency of this method decreases with increase in size or density of opacities of the media since the illumination of the fundus, against which these opacities are to be viewed, is hindered by their presence. (2 figures, 1 reference)

Lawrence L. Garner.

Gonzalez, Vanrell F., Ramos Diaz, T., Carriquiry, P. C., and Iturburu, J. C. **Curare in ocular surgery.** Rev. brasil. oftal. **14**:337-350, Sept., 1955.

Curare is an excellent anesthetic, especially in keratoplasty and cataract surgery. It should not be used by persons not thoroughly familiar with its use. It should be administered only in perfectly equipped operating rooms where facilities for artificial respiration are present. Myasthenia gravis and severe respiratory insufficiencies such as asthma and chronic bronchitis are important contraindications against its use. It is absolutely necessary to adhere strictly to the established rate of injection, 3 mg. of the drug in 2 cc. of distilled water given over a one minute period, waiting two minutes and then giving 1 mg. per minute until the desired effect is obtained. Walter Mayer.

Huber, A. **Comparative, biomicroscopic and microscopic, study of the aqueous.** Ophthalmologica **129**:281-290, April-May, 1955.

For the identification of the corpuscular elements of the aqueous the author has combined the usual biomicroscopic, in situ, method with the direct microscopic examination of fresh aspirated aqueous specimens. The latter method offers more possibilities than the former, particularly higher magnifications and the dark-field technique. Observations pertaining to fibrin, cholesterol and various forms of cells in the aqueous are described and illustrated by clear, black and white drawings.

With his biomicroscopic technique Vogt observed ameboid movements of cells on the posterior surface of the cornea. The aspirated fresh specimen permits observation and recording of these motility phenomena by cinematography. (4 figures, 7 references) Peter C. Kronfeld.

Kettesy, A. **The discrimination value of pseudoisochromatic plates.** Klin. Monatsbl. f. Augenh. **127**:156-163, 1955.

The discrimination value of a plate is a relative index of its reliability. It can be calculated when an equal number of color blind and normal persons read this chart. The sum of the positive values (correct answers by normal persons, incorrect an-

swers by color blind subjects) minus the sum of the negative results (incorrect answers by normal persons, correct answers by color blind subjects) will give in percentage the reliability coefficient.

More important is the evaluation of the whole series of charts. Here we depend on the "Interval of Certainty." That is the total number of charts minus the charts which may even be read by a color-blind subject and minus the charts which may even be missed by a normal person. With this method the Danish charts (Kugelberg) were found superior to Ishihara, Rabkin, Dvorine, A. O. and Stilling. The H-R-R charts were not available. (2 figures, 16 references) Frederick C. Blodi.

Klein, M., Calvert, R. J., Joseph, W. E., and Smith, E. **Rarities in ocular sarcoidosis.** Brit. J. Ophth. **39**:416-421, July, 1955.

Two cases of ocular sarcoidosis are described in patients who, among other manifestations, had such rare abnormalities as binocular episcleral nodules, unilateral optic atrophy and unilateral calcareous cataract. The authors point out the hazards of therapy with calciferol and cortisone. (6 figures, 9 references)

Morris Kaplan.

Krause, Gebhard. **General anesthesia for ocular surgery on children.** Klin. Monatsbl. f. Augenh. **127**:142-147, 1955.

For children from 9 months to 13 years of age the intravenous anesthesia with thiogenal, a thiobarbiturate, has given excellent results. Morphine and atropine are used preoperatively. There were no complications or unpleasant after-effects among 35 children operated on with this anesthesia. Only one child required additional ether. (1 table, 14 references)

Frederick C. Blodi.

Lagos, E. J. J., and de Graziani, J. **Electronic stimulation.** Arch. chil. de oftal. **12**:60-62, Jan.-June, 1955.

In this preliminary report the authors describe the electronic stimulation they bring about with an apparatus built by them. They believe that some atrophic cells can be activated and ascribe this to stimulation and harmonization of disordered functions at the diencephalic level. They have had some encouraging results in cases of facial paralysis and ocular palsy. Walter Mayer.

Land, Richard E. **Modern treatment of infectious and allergic disorders of the eye.** Northwestern Univ. Med. Sch. Bull. **29**:265-273, 1955.

The adrenal steroids inhibit fibroblastic activity, tend to delay healing, and also help to provide suitable conditions for normal repair processes. The drug must be in balance for the disease treated. Topical cortisone is effective in preventing vascularization in interstitial keratitis. Steroid therapy is valuable in nongranulomatous uveitis: in the granular type it should only be used during the acute phase. Nongranulomatous uveitis responds to subthreshold doses of specific streptococcus vaccine. In the treatment of infections of the eye, isolation of the organism, and sensitivity tests are important. The subconjunctival route offers the best method for antibiotics to penetrate the blood aqueous barrier in intraocular infections. Systemic vitamin A reduced the resorption time of hypopyon ulcers. Sulfonamides are the agent of choice in trachoma. (66 references)

Irwin E. Gaynon.

Loisillier, F. Retinophotography. **Technique and result of use of the electronic flash in the Nordenson camera.** Arch. d'opht. **15**:395-401, 1955.

The author describes a modification of the retinal camera of Nordenson according to which an electronic flash unit is placed in the illumination box. Two tubes, type TE 123 (Mazda), were used in order

to gain sufficient illumination, and a third lamp was used for observation of the fundus. All the optical details necessary for the conversion of the instrument are given. Three fundus photographs in color illustrate the excellent results obtained. (5 figures) Phillips Thygeson.

Moore, Gibson J. **Chlorpromazine (largactil) as a premedication in ophthalmic surgery.** Brit. J. Ophth. **39**:109-111, Feb., 1955.

This drug was used as premedication for surgery in 58 of 94 patients. Controls for this experiment were not rigid and the results may be open to question. The author feels that the three or four days of premedication resulted in a calmer, more cooperative and relaxed patient and bases this finding on the clinical impression alone. Although various complications have been described, none were noted here, probably because of the small dosage as well as the short period of medication. If used with general anesthesia the author advises the presence of a skilled anesthesist. (1 table, 6 references) Lawrence L. Garner.

Palick-Szanto, O., and Valér, M. **The importance of fundus changes for the diagnosis of latent lues.** Klin. Monatsbl. f. Augenh. **127**:207-218, 1955.

Among 219 patients with latent lues 80 had fundus changes previously described by the senior author. The disc is of normal color and not elevated, but the margins are somewhat blurred, especially on the nasal side. There is a peripapillary edema and there is sheathing of some of the vessels on and near the disc. The authors believe that these fundus changes have a diagnostic importance. (7 tables, 47 references) Frederick C. Blodi.

Schmidt, Theo. **Relative scotomas.** Ophthalmologica **129**:302-315, April-May, 1955.

This study concerns itself with relative scotomas, that is areas of apparent reduced sensitivity, due to anomalies of refraction. Such a relative central scotoma is readily demonstrable in a presbyopic emmetrope, uncorrected for the test distance of 30 centimeters. The lens correcting the presbyopia eliminates the scotoma. Similar perimetric phenomena are encountered in cases of elevation of the retina by choroidal tumors or of depression of the retina by scleral ectasias. (9 figures, 8 references) Peter C. Kronfeld.

Suda, K., Okuda, J., Kaneda, S., and Kiritoshi, Y. **A new electronic tonometer.** Acta Soc. Ophth. Japan **59**:1179-1182, Aug., 1955.

A new simple electronic tonometer is described in which the change in the electric resistance is used. A plunger to be put on the cornea is supported by two arms of plate spring. A sensitive wire strain gauze is fixed on each arm of plate spring at the other end. A vertical movement of the plunger takes place when it is put on the cornea. The degree of the movement is a function of the intraocular tension. The movement causes a bending of the plate spring arms, consequently an expansion or contraction of the wire strain gauze. Thus a change in the electric resistance results in the gauze. The change is measured by an electric process. According to the authors, this apparatus is as sensitive as that which employs the change in the inductance. (5 figures, 5 references) Yukihiko Mitsui.

Verdaguer, Juan P. **Corneal sutures and late reformation of the anterior chamber.** Arch. chil. de oftal. **12**:75-81, Jan.-June, 1955.

In order to explain the late reformation of the anterior chamber after cataract surgery, the author studied a series of rabbits in which he had placed corneal sutures identical to the silk sutures used

in cataract surgery. He studied the eyes microscopically, and found that a small area of necrosis develops around the suture which eventually will allow the escape of aqueous. He warns against placing too many sutures or tying them too tightly, because this may lead to an escape of aqueous. If the sutures are too tight, there will be an overlapping of surfaces instead of apposition (5 figures, 15 references) Walter Mayer.

6

OCULAR MOTILITY

Andreani, D., and Guzzineti, G. C. **The vertical component of the Stilling-Türk-Duane syndrome.** Ann. di ottal. e clin. ocul. **81**:375-382, Sept., 1955.

Seven cases are analyzed. A vertical motor deficit was always observed and this must be taken into account in surgical correction. (32 references)

John J. Stern.

Breinin, G. M., and Moldaver, J. **Electromyography of the human extraocular muscles. I. Normal kinesiology; divergence mechanism.** A.M.A. Arch. Ophth. **54**:200-210, Aug., 1955.

Ocular muscle myograms may be made with a minimum of discomfort on human subjects. A number of interesting findings are reported by the authors in this experimental series: 1. divergence is an active and not a passive process, 2. paretic muscle movements can be analyzed, 3. the ocular muscles have no position of innervational rest, and 4. reciprocal innervation is easily demonstrated. (10 figures, 20 references) G. S. Tyner.

Fender, D. H. **Torsional motions of the eyeball.** Brit. J. Ophth. **39**:65-72, Feb., 1955.

The author employs an ingenious method of reflections to record eye motions in an attempt to ascertain whether torsional movements exist for small movements of the visual axis. The results indicate that torsional movements do occur even when the ocular excursions from the primary position are so small that normal torsion should not take place. (7 figures, 6 references)

Lawrence L. Garner.

Jonkers, G. H. **Five years of orthoptics.** Ophthalmologica **130**:69-79, July, 1955.

The author reports on the results of combined, surgical and orthoptic, treatment in 161 cases of nonparalytic motor anomalies. He divides his material into the following groups: esotropia with normal correspondence, esotropia with abnormal correspondence, accommodative esotropia, intermittent exotropia, constant exotropia, heterophoria and amblyopia. His criteria of a cure are fairly rigid. If the cover test either for distance or near reveals a deviation which the patient does not correct immediately and spontaneously, he must be considered as not cured. The definition of cure should include a measure of its permanency. "Approximately cured" is a convenient term for many of the results. The most gratifying results, attributable specifically to orthoptics, were obtained in the cases of amblyopia, constant exotropia and accommodative esotropia. (11 tables)

Peter C. Kronfeld.

Kamouchi, T. **Electromyographic study in neurogenic palsy of extraocular and levator muscles.** Acta Soc. Ophth. Japan **59**:791-803, July, 1955.

The electromyogram in neurogenic palsy of ocular muscles is analysed. Spike discharge, low amplitude neuromuscular unit voltage were observed even in paralysed muscles. Reinnervation voltage was also observed in some cases. Fibrillation voltage was not recognized. A grouping voltage was apt to occur in a palsy of muscles. Uneven recruitment was ob-

served in a high degree of palsy. (14 figures, 28 references) Yukihiko Mitsui.

Malbran, E., and Norbis, A. L. **Unilateral paralysis of the elevators of supranuclear origin.** Brit. J. Ophth. **39**:73-84, Feb., 1955.

Ten cases of unilateral elevator paralysis and the tests used to diagnose the supranuclear nature of the lesion are described. White's classification of the three types of monolateral paralysis of both elevators is employed in the decision as to the surgery. The authors stress the frequency with which pseudoptosis is regarded as a true partial ptosis, while the elevator palsy is overlooked. This article is well worth careful scrutiny since the surgical principles are definitely not those described by White. Two-stage surgery is common because of the amount of dissociation noted and the authors employ marginal myotomy of the inferior obliques with recession and resection in the usual procedure. The marginal myotomy is of interest because of its rare use here. The article brings out the point again that variable techniques can produce good results. (5 figures, 1 table, and 8 references) Lawrence L. Garner.

Malbran, J., Norbis, A. L., and Malbran, E. **The treatment of paralysis of the superior oblique muscle.** Ophthalmologica **130**:97-112, Aug., 1955.

In eleven cases of paralysis of the superior oblique muscle excellent results were obtained with McLean's method of placing a tuck in the distal portion of the tendon of the paralyzed muscle (cfr. Arch. Ophth. 42:50, 1949). (15 figures, 28 references) Peter C. Kronfeld.

von Nordheim, R. W. **Naphazoline in treatment of iridocyclitis and glaucoma.** Ophthalmologica **130**:85-93, July, 1955.

Naphazoline is identical with the imidazoline derivative privine which has found acceptance as a nasal decongestive. In the paper under review beneficial effects of topically administered privine in 1:1,000 concentration are reported in one case of iridocyclitis and in one atypical case of glaucoma. In the rabbit topically applied privine delays the entrance into the anterior chamber of intravenously administered fluorescein. (3 figures, 1 graph) Peter C. Kronfeld.

Sternberg, A., and Raab, C. **A new muscle scheme.** Ophthalmologica **130**:53-64, July, 1955.

The new scheme is a very much expanded form of the diagram of the action of ocular muscle shown as figure 595 in Duke-Elder's Textbook of Ophthalmology Volume I. Added to it is a tabular representation of the characteristic features of typical fresh paralyses of individual ocular muscles (primary and secondary deviation, ductions and head tilt). (6 figures, 6 references) Peter C. Kronfeld.

7

CONJUNCTIVA, CORNEA, SCLERA

Boudon, Cl. **Corneal lesions due to obstetrical trauma.** Arch. d'opht. **14**:787-801, 1954.

The author reports on the corneal changes in two infants who received obstetrical injuries due to forceps. The first infant sustained a right-sided frontotemporal wound which led to cicatrization. It was accompanied by a corneal lesion of the right eye from which partial opacification of the stroma resulted. A right esotropia developed during the third month. In subsequent months the stromal opacity of the cornea cleared but a partial detachment of Descemet's membrane remained which appeared as a glass-like membrane in the anterior chamber. There was an irregular astigmatism of 6.00D.

The left eye showed no astigmatism.

The obstetrical trauma in the second infant appeared as an enormous hematoma of the right frontal region, with edematous and ecchymotic lids. No gross corneal involvement was noted by the mother or attending obstetrician but when the child was first examined ophthalmologically at the age of six years, an opacification of Descemet's membrane was noted and visual acuity was less than 1/20.

The author reviews in detail the literature on eye changes due to obstetrical trauma, commencing with the first known papers of deWecker and Dujardin in 1896. He then discusses the development of retrocorneal membranes due to injury to Descemet's membrane and concludes that with few exceptions all corneal obstetrical lesions are caused by tears in Descemet's membrane. He mentions the various therapeutic measures available, including hyaluronidase and cortisone, but expresses the opinion that no method influences the natural spontaneous repair. (31 references) P. Thygeson.

Eadie, S., and Thompson, M. **Keratoconjunctivitis sicca treated with cortisone and ACTH.** Brit. J. Ophth. **39**:90-97, Feb., 1955.

Twelve patients received therapy for this condition and controls were obtained by treating only one eye in each patient while the other went untreated. The stronger solutions gave better results in the more aggravated cases although the weaker solutions used locally were adequate for most cases. Hydrocortone locally had no particular advantages over cortisone nor did the use of the ointment form offer any greater efficacy. Acth was not any more effective than the local preparation. Although symptoms were ameliorated in almost all cases, no clinical improvement was noted in the Shirmer test, indicating that lacrimal secretion was not increased.

Three patients in whom the relief was only minimal when local cortisone was employed received marked benefit when the lacrimal puncta were sealed. This latter treatment should be reserved for use in severe cases inasmuch as sealing the puncta may give rise to a troublesome epiphora which in some instances may be more aggravating than the original complaint. (4 tables, 15 references)

Lawrence L. Garner.

Forni, S. **A new centering-marking device for keratoplasty.** Ophthalmologica **130**:151-154, Aug., 1955.

The instrument consists of a metal ring, 10 mm. in diameter, mounted on the type of handle commonly used in ocular surgery. The undersurface of the ring carries eight evenly spaced prongs which make marks on the cornea which are very helpful during the insertion of the indirect sutures. These prongs also hold the instrument in place while the trephine which, by means of plastic insets, fits the aperture of the ring snugly, is first applied to the cornea to mark the outline of the graft. (5 figures, 6 references)

Peter C. Kronfeld.

Matunaga, T., Asakage, T., and Kunitomo, N. **A study of trachoma in new-born infants. Report I. The onset of trachoma during the 18-months' period after birth.** Acta Soc. Ophth. Japan **59**:1027-1038, Aug., 1955.

In a town near Tokyo with a population of 26,000 and trachoma index of 12 percent, 102 new-born infants were examined clinically as well as bacteriologically each week for 18 months after delivery. At the first examination after delivery no pathologic changes were found in the conjunctiva. During the 18-months' observation period, however, 96 of the 102 infants were found to have some kind of conjunc-

tivitis. The nature and course of these conjunctival inflammations were carefully followed. An acute onset of conjunctivitis was observed in 17 cases, of which three were inclusion conjunctivitis, two trachoma, 11 epidemic keratoconjunctivitis and one gonoblennorrhea. A subacute onset of conjunctivitis was observed in 76 other cases, in 62 of which it was followed by the development of follicles. In 44 of these 62 cases there was finally a development of symptoms characteristic of the chronic stage trachoma. In 24 of these cases the diagnosis was indisputable as inclusions were found at onset. A chronic or insidious onset of conjunctivitis was observed in 15 cases. In none of these cases was there a development of signs of trachoma during the course of the disease. The authors emphasize the fact that they have never seen an insidious onset of trachoma. They conclude that trachoma has either an acute or subacute onset. (5 figures, 5 tables) Yukihiko Mitsui.

Mitsui, Y., and Hanabusa, J. **Corneal infections after cortisone therapy.** Brit. J. Ophth. **39**:244-250, April, 1955.

Four cases of hypopyon keratitis due to a fungus infection following the use of topical cortisone or hydrocortone are described and one of Pseudomonas infection. There were permanent central scars in the cornea and marked loss of vision. The complicating corneal lesion began about 10 to 14 days after the use of the therapy. To ascertain the presence of fungi in normal as well as in treated eyes, the authors cultured and examined two groups of patients. In the treated group, the presence of fungi in the conjunctival sac after cortisone was found to be 67 percent (42 out of 63 cases); in control cases 18 percent (12 out of 65 cases). When hydrocortisone was put into the eyes of the 18 subjects in whom no fungus had been demonstrated, a fungus was noted after 14 days of therapy in 50 percent of the cases. The common fungus found was Candida albicans and therapy is not very effective. A shorter period of cortone type therapy as well as better use of cultures is advised. (7 figures, 2 references)

Lawrence L. Garner.

Offret, G., and Chilaris, G. **Statistical study of results in 170 corneal grafts.** Arch. d'opht. **15**:373-382, 1955.

In an extensive review of the literature on keratoplasty, the authors discuss the criteria of success used by various authors in analyzing their cases. They conclude that in 4,360 cases of keratoplasty, cited since 1948, the results were good in from 45 to 65 percent; that from 15 to 20 percent of the patients in this good-result group acquired vision superior to 5/10; that an additional 20 or 30 percent of the entire group were improved by the operation; and that the results were unfavorable in only 10 or 15 percent.

In their own series of 170 cases, in 29 of which penetrating keratoplasty was done and in 141 lamellar keratoplasty, 62 percent of the patients acquired a vision superior to 1/10, and 18.2 percent of these acquired an acuity of 4/10 or better. (1 table, 1 graph, 34 references)

Phillips Thygeson.

Renard, G., Lievre, J., Bloch-Michel, H., and Saraux, H. **Scleromalacia and scleromalacia perforant.** Arch. d'opht. **15**: 479-486, 1955.

The authors discuss perforant scleromalacia and its relationship to nonperforating scleromalacia. In this connection they report in detail the clinical history and laboratory findings in a woman of 75 years who had had arthritis since the age of 25 and who showed a progressive thinning of her sclera. This thinning was at first unilateral but later became bilateral and was accompanied by glaucoma. The thinnings were maximal in the inferior temporal quadrants. There were subcuta-

neous rheumatoid nodules present and biopsy of one revealed typical histopathologic changes. In reviewing the literature the authors conclude that in perforant scleromalacia there are two factors: 1. the rheumatoid nodule which leads to the perforation, and 2. the initial scleral lesions which modify the tissues and favor the appearance of nodules. They note that scleral changes of metabolic origin include scleromalacia with porphyrinuria and senile hyaline plaques. (5 figures, 15 references) P. Thygeson.

Ricci, L. **Iodine vapor in herpetic keratitis.** Boll. d'ocul. **34**:373-376, June, 1955.

The treatment of herpetic keratitis with iodine vapor was more effective in the superficial rather than the deep forms of the disease. (2 tables)

William C. Caccamise.

Rocha, H., and Coscarelli, E. **Lamellar keratoplasty in rodent ulcer.** Rev. brasil. oftal. **14**:355-368, Sept., 1955.

The authors describe three patients with ulcus rodens, in whom lamellar keratoplasty was done, obtaining one failure and two permanent and complete cures. They give a brief summary of the clinical characteristics and etiologic theories of rodent ulcer. (6 figures, 20 references) Walter Mayer.

Ryan, R. W., O'Rourke, J. F., and Iser, G. **Conjunctivitis in adenoidal-pharyngeal-conjunctival virus infection.** A.M.A. Arch. Ophth. **54**:211-216, Aug., 1955.

A disease entity due to Type 3 of the APC group of viruses is described. The occurrence of pharyngitis and conjunctivitis due to this virus may occur in sporadic or epidemic form. The conjunctivitis was self-limited and in description not unlike that seen in the pharyngeal stage of measles. (4 figures, 11 references)

G. S. Tyner.

Semeraro, Edmundo. **Surgery of symblepharon.** Rev. brasil. oftal. **14**:351-353, Sept., 1955.

The author describes his own technique in which, after obtaining a lysis of all the adhesions, he interposes a fine piece of rubber between the two bleeding and raw surfaces, which is fastened to the lid by one suture. After 14 days, the piece of rubber is removed. (1 figure)

Walter Mayer.

Verrey, A. **Epidemic keratoconjunctivitis.** Ophthalmologica **129**:261-270, April-May, 1955.

In 1953 and 1954 small epidemics of epidemic keratoconjunctivitis (EKC) were observed in Switzerland. In the majority of the cases the clinical symptoms and the course of the disease were typical. During the same period a fair number of cases of punctate superficial keratitis without conjunctivitis or adenopathy was observed. This keratitis may have represented a forme fruste of the typical EKC. In a good many of the cases observed by A. Verrey the disease was confined to one eye. Another remarkable feature of his cases was the almost complete absence of permanent scarring.

The discussion of Verrey's paper brought out the well-known spreading of the disease in the course of routine ophthalmological procedures, such as removal of corneal foreign bodies or tonometry. Disinfection of tonometers by means of mercurials and of the operator's hands were effective in preventing further spread of the disease. (21 references)

Peter C. Kronfeld.

Zaverucha, Abraão. **A case of keratitis caused by an insect bite.** Arq. brasil. de oftal. **17**:109-113, 1954.

In a patient who was stung by a bee directly on the cornea, a localized keratitis developed, in the center of which the point

of penetration of the sting was found. Vision was reduced to *20/30*. Treatment consisted of local applications of dionin and vitamin A, and systemic administration of penicillin and vitamin A. At the time of discharge from the hospital the patient appeared to be clinically cured with a decrease in the corneal opacity. The literature is reviewed briefly. (3 figures, 4 references) James W. Brennan.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Auricchio, G. **Uveal tuberculosis in infancy.** Arch. di ottal. **59**:159-184, May-June, 1955.

After an extensive review of the literature five cases illustrating the clinical forms of uveal tuberculosis are described. (74 references) John J. Stern.

Corkey, J. A. **Ophthalmia nodosa due to caterpillar hairs.** Brit. J. Ophth. **39**: 301-306, May, 1955.

The hairs are usually introduced when the caterpillar strikes against the eye, leaving many of the hairs which are subsequently rubbed into the cornea by the patient since there is immediate painful itching. A case which followed the typical course is described. The true diagnosis was made after enucleation. (4 figures, 15 references) Morris Kaplan.

Espildora-Couso, José. **Toxoplasmosis.** Arch. chil. de oftal. **12**:63-68, Jan.-June, 1955.

The author reviews the history, symptomatology and diagnostic features of congenital and acquired toxoplasma infections and presents the case history of an infant with congenital toxoplasmosis who had bilateral macular exudative lesions, complicated later by an anterior iridocyclitis. There were cerebral calcifications and the organisms were isolated from the cerebrospinal fluid. The patient had also a facial paralysis. (6 references)

Walter Mayer.

Gougnard-Rion, C., and Paris, L. **Heterochromia in the syndrome of Claude Bernard-Horner.** Arch. d'opht. **14**:802-805, 1954.

The authors note that ocular modifications after section of the cervical sympathetic were observed as early as 1727 by Pourfour and Petit, that Claude Bernard completed the experimental study of sympathectomy in 1852, and that Horner described the syndrome now known as the syndrome of Claude Bernard-Horner in 1869. The fundamental symptoms of the syndrome sometimes have associated with them a vasodilation of the conjunctiva and retina, a temporary increase in skin temperature, abolition of sweating, dryness of the hair, baldness, diminution of lachrymal secretion, and finally, in certain cases, heterochromia due to decoloration of the iris.

The authors report four cases of the syndrome associated with heterochromia. They note that heterochromia is frequent when the lesion is congenital or when it develops before the iris has become fully pigmented. Two of the cases were due to obstetrical trauma, one was believed to be due to toxoplasmosis, and one was of totally unknown etiology. (1 figure, 2 references) P. Thygeson.

Kimura, S. J., Hogan, M. J., and Thygeson, P. **Fuchs' syndrome of heterochromic cyclitis.** A.M.A. Arch. Ophth. **54**: 179-186, Aug., 1955.

This disease occurs more frequently than is usually appreciated; although it is incurable, the prognosis is good and much diagnostic effort can be avoided if the condition is recognized. Clinically, the eye is not inflamed and the patient is symp-

tomless until opacities in vitreous or lens interfere with vision. The heterochromia develops slowly. In its fully developed stage, the disease consists of heterochromia, cyclitis, and cataract. Secondary glaucoma is apt to occur. The cause of the disease is unknown and there is no known treatment except management of cataract or glaucoma. (5 figures, 6 tables, 21 references) G. S. Tyner.

Lagos, Eduardo J. J. **Ocular leptospirosis.** Arq. brasil. de oftal. **17**:100-108, 1954.

Leptospirosis, or Weil's disease, is an acute febrile disease which often has ocular manifestations or complications. Conjunctival redness is an early symtom, occurring in the preicteric stage, and is observed in approximately 40 percent of the cases. It is most intense in the inferior fornix and is accompanied by photophobia, lacrimation and tenderness upon slight pressure. A herpetiform eruption may simultaneously involve the skin of the lids.

More important, however, are lesions of the uveal tract. These range from congestion of the iris to acute iridocyclitis with the formation of dense posterior synechiae which resist mydriatics. Posterior uveitis characterized by turbidity of the vitreous which assumes a membranous appearance is considered pathognomonic of leptospiral uveitis. Ophthalmoscopic examination reveals the presence of these membranes which appear to be attached to the papilla and extend forward into the vitreous. These may persist for several years. Diagnosis is made from the clinical picture of fever, chills, headache, vomiting, jaundice, muscular pains and splenomegaly. Confirmation is made by a specific agglutination reaction. No specific treatment is available. Prophylaxis may be obtained by hygienic measures, rodent elimination and purification of water. A vaccine has been used in Japan, although the results are not reported.

A case history is presented. (1 figure) James W. Brennan.

Mathers, R. M., and Moodie, A. R. **Recurrent choroidal detachment.** Brit. J. Ophth. **39**:437-442, July, 1955.

Detachment of the choroid occurred in a patient who had infection of the antrum with chemolytic streptococcus on the same side. After eight months, recovery was all but complete; there was a slight loss of field in the extreme periphery. The detachment recurred five years later and again disappeared spontaneously. The central vision was always 6/6. (2 figures, 29 references) Morris Kaplan.

Miescher, A. **Experimental studies concerning sympathetic ophthalmia.** Ophthalmologica **130**:128-150, Aug., 1955.

Presented in part by Streiff at the annual meeting of the Swiss Ophthalmological Society (October 1954), this study was reviewed in an earlier issue of this journal. (4 figures, 4 tables, 39 references) Peter C. Kronfeld.

Norbis, A. L., and Malbrán, E. **Behçet's syndrome.** Arch. oftal. Buenos Aires **30**: 269-274, July, 1955.

Consisting mainly in recurrent hypopion uveitis, aphthous stomatitis, ulcers of the external genitalia, exudative arthritis and erythema nodosum-like skin lesions, this seemingly viral disease may, and usually does, lead to severe visual damage; yet, it rarely proves lethal. Diagnosis has to be made with respect to all varieties of Hebra's erythema exudativum multiforme. Two cases are presented, in one of which the condition was unilateral. (28 references) A. Urrets-Zavalía, Jr.

Osorio, Luis A. **Iridoschisis.** Rev. brasil. oftal. **14**:323-335, Sept., 1955.

The author describes the ophthalmologic findings in a patient with iridoschisis, keratoglobus, reticular dystrophy

of the cornea, glaucoma and many foci of retinal and choroidal atrophy, especially in the papillomacular area. He reviews the history, pathologic anatomy and diagnosis of this disease. (3 figures, 1 chart, 28 references) Walter Mayer.

Sivasubramaniam, P., and Hoole, T. **Bilateral essential atrophy of the iris.** Brit. J. Ophth. **39**:119-121, Feb., 1955.

The authors report this case not only because it is rare, but also because bilateral cases are rarer still. (3 figures, 1 reference) Lawrence L. Garner.

Streiff, E. **The role of uveal auto-antibodies in sympathetic ophthalmia.** Ophthalmologica **129**:346-349, April-May, 1955.

Streiff briefly reports on experimental studies pertaining to the possible role of uveal antibodies in posttraumatic, phacoanaphylactic and vaccinia uveitis. These three forms of uveitis were produced in rabbits that had been sensitized to uveal tissue and also in normal control rabbits. The posttraumatic as well as the phacoanaphylactic uveitis took essentially the same course in the normal and in the sensitized rabbits. Vaccinia uveitis induced by the intravitreal injection of vaccinia virus took essentially the same, fairly mild course in the normal and in those sensitized rabbits whose skin reaction to the uveal antigen had remained normal. In some of the sensitized animals a marked cutaneous hypersensitivity to the uveal antigen developed. In these animals the vaccinia uveitis took a more severe course and the cellular reaction, while strictly confined to the infected eye, remotely resembled sympathetic ophthalmia.

Thus it has been shown that in the rabbit the presence of uveal antibodies is not sufficient to elicit inflammatory reactions of the uvea, but is capable of influencing such reactions qualitatively and quantitatively. (2 figures, 14 references)

Peter C. Kronfeld.

9

GLAUCOMA AND OCULAR TENSION

Andreani, D. **The results of Blaxter's bulbus compression test before and after Schmidt's water test in normal subjects and in incipient glaucoma.** Ann. di ottal. e clin. ocul. **81**:359-365, Aug., 1955.

In normal eyes and eyes with prodromic glaucoma the bulbus compression test gives identical results before and after the water drinking test; in chronic simple glaucoma a difference can be found which indicated an obstacle to the aqueous outflow. (14 references) John J. Stern.

Andreani, D., and Lepri, G. **Recent observations on the action of acetazoleamide in glaucoma therapy.** Ann. di ottal. e clin. ocul. **81**:389-402, Sept., 1955.

Acetazolamide (diamox) was used in 54 patients with various forms of glaucoma. The period of administration ranged from several days to four months, the dosage from 250 to 1000 mg. daily. Undesirable effects were: occasional general toxic disturbances, and in some cases loss of efficiency with prolonged use. Nevertheless, the drug proved its value, particularly in secondary glaucoma, congestive glaucoma and in those cases where a rapid, if not durable, fall of the ocular tension is desirable. (6 references) John J. Stern.

Becker, B., and Middleton, W. H. **Long-term acetazoleamide (Diamox) administration in therapy of glaucoma.** A.M.A. Arch. Ophth. **54**:187-192, Aug., 1955.

No serious untoward effects have been noted in 15 months of continuous therapy. Unpleasant side effects, however, occurred in four out of five patients and necessitated discontinuing therapy in one out of four patients. 62 percent of patients with

uncontrolled open angle glaucoma were successfully maintained for periods of 6 to 15 months on "around the clock" doses of 250 to 2000 mg. daily. All patients were also treated concurrently with miotics. (4 tables, 6 references) G. S. Tyner.

Brognoli, Carlo. **Can the introduction of air into the anterior chamber provoke glaucoma? I.** Ann. di ottal. e clin. ocul. **81**:411-417, Sept., 1955.

In four out of 12 rabbit eyes with normal iris, the introduction of an air bubble into the anterior chamber caused increase in tension after one to two hours. After 15 hours the tension was normal, after 40 hours the air was absorbed. In eyes with scopolamine mydriasis or basal iridectomy, no such increase of tension was observed. (25 references)

John J. Stern.

de Camargo Alves, João Baptista. **The problem of classification of glaucoma.** Arq. brasil. de oftal. **17**:39-50, 1954.

The various classifications of primary glaucoma are analyzed and criticized by the author who considers the classification of Sugar to be the most practical, since it correlates the most recent developments with the pathogenesis. Criteria to be considered in classification are age, size of the angle, narrowness or obstruction of the angle, congestion and response to treatment. The author simplifies Sugar's classification. (20 references)

James W. Brennan.

Campbell, D. A., Gloster, J., and Tonks, E. L. **Some observations on the water-drinking test in glaucomatous and non-glaucomatous subjects.** Brit. J. Ophth. **39**: 193-203, April, 1955.

This preliminary study of the nature of diuresis and of the alterations in diffusible and nondiffusible constituents of the blood in relation to the intraocular pressure shows that the diuresis induced in glaucomatous subjects is consistently normal and indicates normal function of the posterior lobe of the hypophysis. That the rise in intraocular pressure is partly due to osmotic changes between the blood and eye is born out by the findings which reveal, in the majority of cases, an initial rise in tension which coincides with a fall in both serum protein and serum sodium. A few cases were found where the rise in intraocular pressure was accompanied by a rise in serum sodium. This is not explained. The fall in blood sodium occurring during the greatest rise in tension is not at all proportional to that rise, indicating that some other regulating mechanism must exist in the eye. This is true in both normal and glaucomatous subjects. (4 figures, 5 tables, 32 references)

Lawrence L. Garner.

Cascio, G., and Galante, C. **The physiopathology of traumatic glaucoma.** Arch. di ottal. **59**:220-236, May-June, 1955.

Two cases of traumatic glaucoma are presented and the literature concerning this condition is critically discussed. It is believed to be attributable to vasodilatation due to the liberation of histamine-like substances. (20 references)

John J. Stern.

Higgitt, A., and Smith, R. **Reading test in glaucoma.** Brit. J. Ophth. **39**:103-108, Feb., 1955.

Two patients with an unusual type of shallow-angle glaucoma are described. Interestingly, the mydriatic and dark-room tests were negative here as was the water provocative test. The reading test (accommodative effort for thirty minutes) resulted in a rise in tension in both cases. Tension was normalized when a mydriatic was used or a miotic. Gonioscopy showed closing of the angle only after reading. Using a miotic like pilocarpine could prevent the rise in tension if used prophylactically.

The authors postulate some difference in chamber angles that may account for closure of the angle on pronounced accommodative effort or its prolonged effect.

The use of the reading test in a large series of cases may prove to be of interest since this test is rarely employed today despite the fact that Gradle described it in 1931. (6 figures, 8 references)

Lawrence L. Garner.

Matsumoto, T. **The tension-lowering mechanism of iridencleisis.** Acta Soc. Ophth. Japan **59**:1230-1234, Aug., 1955.

Iridencleisis was done in one eye of rabbits; after a certain period fluorescein solution was instilled into both eyes of the rabbits. The agent penetrated into the aqueous of the eye operated upon in greater concentration than in the control eye for the first two hours. However, it disappeared earlier in this during the following several hours. Thus there occurred a crossing of these concentration-time curves for fluorescein in the aqueous by the second hour after instillation and remained for three months after the surgery. Matsumoto suggests that after iridencleisis there is an acceleration of the outflow of the aqueous either by filtration through the conjunctiva or by streaming through canalized paths. (3 figures, 1 table) Yukihiko Mitsui.

Monnet, P., Gilly, R., Levy, M., Gauthier, J., and Verney, R. **Congenital glaucoma with nephropathy.** Pediatrie **10**:617-622, 1955.

The authors describe an infant with the syndrome reported in 1952 by Lowe, Terry and MacLachlan which is characterized by organic aciduria, decreased renal ammonia production, hydrophthalmos and mental retardation. Their patient, an infant five months of age, had congenital glaucoma, a deficiency of growth, albuminuria and an increased pH of the urine. They also found four infants with glaucoma but without albuminuria or other gross abnormalities except for a low or subnormal alkali reserve. Urinary chromatography by Dent's method revealed hyperaminoaciduria. (2 figures, 1 table, 5 references) F. H. Haessler.

O'Reilly, Guillermo. **Surgical treatment in glaucoma.** Arch. chil. de oftal. **12**:33-52, Jan.-June, 1955.

The author is a strict follower of the mechanical theory of glaucoma and explains open and closed angle glaucoma according to the ideas of Chandler. He presents the case histories of 48 patients, and feels that in an acute glaucoma a peripheral iridectomy should be done, which is just as efficient as a total iridectomy. In chronic narrow-angle glaucoma of very long standing, a filtering procedure should be done. In many cases iridencleisis is a good operation, but if the anterior chamber fails to reform or appears late without a filtering bleb, more harm than good has been done to the patient. The operation of choice is a cyclodyalisis, according to the technique of Allen or Chandler, which has the advantage of direct visualization over the classical techniques of Blascoviks or Heine. At the end of this procedure a peripheral iridectomy should always be done. (53 references)

Walter Mayer.

Primrose, John. **Dibenzyline in glaucoma.** Brit. J. Ophth. **39**:307-311, May, 1955.

Dibenzyline was used in acute and simple glaucoma instead of dibenamin because the side effects of the former are considerably less. The drug is generally given orally although in emergencies it can be given by vein in doses of 15 to 25 mg. There is an immediate fall in blood pressure, which returns to normal in three to six hours, accompanied by tachycardia, vasodilatation and syncope. In normal eyes there is little effect noted although

the eyelids may become droopy. In simple and in absolute glaucoma very little benefit was obtained from its use whereas in acute glaucoma there was reduction of tension in three out of six patients and with one relapse. In all cases emergency surgery was done, which was made much easier and much more successful because of the drug. (1 table, 5 references)

Morris Kaplan.

Sautter, H., and Daubert, K. **Meteorologic factors in acute glaucoma.** Ophthalmologica **129**:381-389, June, 1955.

During a four-year period 64 cases of acute glaucoma were observed in the Tuebingen (Germany) area. An ophthalmologist (Sautter) and a meteorologist (Daubert) investigated the possibility of a relationship between the onset of these glaucomas and meteorologic factors. The conclusion was reached that acute glaucoma occurs more frequently during movements of warm or cold air masses in the higher atmosphere. (3 figures, 22 references) Peter C. Kronfeld.

Stallard, H. B. **Late restoration of the anterior chamber by surgery.** Brit. J. Ophth. **39**:112-113, Feb., 1955.

Restoration of the anterior chamber with normalized tension is described after four and one half months of absent chamber following trephine surgery. A bold, direct surgical attack to close the trephine area with a lamellar scleral plug was used. A conjunctival flap is dissected from the limbus about 8 mm. upwards. The thinned bleb area is removed, since the author assumes that it has been fistulous, the donor of sclera being selected from the site of the cyclodialysis, which follows. The scleral plug is 0.5 mm. thick and 1.5 mm. in diameter; it is held in place by a single suture which unites the conjunctiva to the edges of the trephine opening and is incorporated into the suture by a thin superficial bite. The author adds that the scleral plug may be avoided since a piece of the capsule of Tenon may be pulled down to cover the trephine opening. The cyclodialysis is performed after the conjunctival flap has been secured, and is followed by an air injection into the anterior chamber. (2 figures)

Lawrence L. Garner.

Thorpe, Harvey E. **Acetazoleamide (Diamox) in glaucoma surgery.** A.M.A. Arch. Ophth. **54**:221-224, Aug., 1955.

After a short clinical series, the author states that although diamox tends to promote rapid reformation of the anterior chamber after glaucoma surgery, it may be contraindicated in filtering operations because of its minimizing effect on cystic bleb formation. (4 references)

G. S. Tyner.

Wehner, G., Boehringer, H. R., and Koenig, F. **Late results of glaucoma operations.** Ophthalmologica **129**:252-261, April-May, 1955.

The Eye Clinic of the University of Zurich (Switzerland) made a follow-up study of its surgically treated primary glaucomas. The material comprised 100 trephining operations, 32 iridencleises and 72 retrociliary cyclodiathermies. A distinction was made between simple (open-angle) and congestive (closed-angle) glaucomas. Normalization of tension was accomplished by most of the filtering operations and about 67 percent of the cyclodiathermies. The findings of most of the earlier follow-up studies were confirmed. In open-angle glaucoma the ultimate visual result was very decidedly dependent upon the stage of the glaucoma at the time of surgery.

In a considerable percentage of the more advanced glaucomas the deterioration of the visual fields continued in the face of normal tension. The authors, therefore, recommend early surgery, that is a filtering operation, unless the ocular

tension stays below 40 mm. Hg Schiøtz in which case a cyclodiathermy may be equally effective. The latter operation becomes most useful as a second procedure after filtering operations have failed. Contrary to an earlier impression, the authors did not find the results of cyclodiathermies to be superior to those of the filtering operations in the far advanced glaucomas. (6 tables, 3 references)

Peter C. Kronfeld.

10

CRYSTALLINE LENS

Amenabar, Mario. **Surgery of secondary cataract.** Arch. chil. de oftal. **12**:53-55, Jan.-June, 1955.

A new instrument to deal with secondary membranes is described. It is a combination of a discission knife and an iris hook with which one can perform capsulotomies and capsulectomies with total extraction of the membrane at once. (3 figures) Walter Mayer.

Bellows, J., Lieberman, H., and Abrahamson, I. **Flattened anterior chamber.** A.M.A. Arch. Ophth. **54**:170-178, Aug., 1955.

The article includes a report on experimental and clinical observations of flat anterior chamber after cataract surgery. The authors believe that the precipitating cause is a continuous or transient leak in the wound. As a result of leakage, the dynamics of aqueous flow are altered, resulting in forward movement of the vitreous against the iris. This causes an impediment to passage of aqueous into the anterior chamber. Accumulation of aqueous leads to "stagnation," and choroidal edema results.

Prophylaxis includes good wound closure, adequate iridectomy or iridotomy and care in removal of sutures. Treatment consists of 1. closing an obvious defect, 2. dilatation of the pupil after three or four days if there is no obvious defect of closure, 3. acetozoleamide (Diamox), 4. injection of air into the anterior chamber after four or five days, and 5. posterior sclerotomy or incision of the face of the vitreous in some cases. (2 charts, 6 tables, 11 references) G. S. Tyner.

Boerner, R. **The implantation of the Ridley lens.** Klin. Monatsbl. f. Augenh. **127**:147-156, 1955.

In four patients the extraction was intracapsular, in 13 patients it was extracapsular. In all four intracapsular cases the plastic lens eventually disappeared into the vitreous. One lens could be extracted and one eye became blind.

Among the 13 extracapsular extractions the lens had to be removed twice and in another two eyes a discission was necessary. Only one eye had a postoperative corrected vision of 5/5. (8 figures, 22 references) Frederick C. Blodi.

Espildora Luque, C., Gormaz, A., Lama, G., and Vilaseca, A. **Ridley's operation.** Arch. chil. de oftal. **12**:56-59, Jan.-June, 1955.

In their series of ten patients operated upon according to Ridley's technique, the authors had six good results, two doubtful results and two bad ones. One of the patients is of special interest because severe bronchopneumonia developed several months after the operation and the visual acuity diminished considerably as a result of a very severe iridocyclitis. A conventional intracapsular extraction was done on the other eye later and it also developed a severe iridocyclitis. At the end, the eye with the Ridley lens had the better acuity. Walter Mayer.

Finn, C. B. **Ridley lens implant; case report.** Louisiana St. Med. Soc. J. **107**: 374-376, Sept., 1955.

A case of Ridley lens implant is reported, after a linear extracapsular ex-

traction of the lens was done. There was some subluxation of the lens and a late iritis with posterior synechia. The pupil became occluded and it became necessary to scrape the plastic surface of the lens and to separate the posterior synechiae. Vision became correctable to 20/30. (2 references) Irwin E. Gaynon.

Liebman, Sumner D. **Postnatal development of lamellar cataracts in premature infants.** A.M.A. Arch. Ophth. **54**:257-258, Aug., 1955.

In a mass study of premature infants, the development of lamellar cataracts was noted in the postnatal period. This is of considerable interest since these cataracts are considered congenital in origin. (1 figure, 3 references) G. S. Tyner.

Paiva, Clovis. **Experiences with Ridley's operation.** Arq. brasil. de oftal. **17**: 89-99, 1954.

Case histories of two patients are presented to illustrate the Ridley procedure of cataract extraction. Both operations were executed smoothly. One patient had postoperative iritis with deposits of pigment on the face of the plastic lens which impaired vision for several months. Final corrected acuity was normal in each instance, however. The author uses a plastic lens which is 1 mm. smaller than the normal lens, in order to avoid pressure on the ciliary body. He follows Ridley's original procedure, with extracapsular extraction, removal of as much anterior capsule as possible, irrigation of the anterior chamber until the pupil appears black, and insertion of the plastic lens. This is done slowly and with lateral movements to slide it under the iris below. Finally, the iris is grasped above and the lens is maneuvered into position. A peripheral iridectomy is made above, and the wound is closed. He prefers the intracapsular extraction as a routine procedure, as the uncertain and stormy postoperative period does not seem to justify the extracapsular operation.

Possible indications for the procedure are the restoration of binocular vision in patients with monocular cataract, the elimination of heavy aphakic corrections and an increased visual field not present otherwise. (4 figures, 6 references) James W. Brennan.

Papolczy, F. **Cataract extractions on highly myopic eyes.** Ophthalmologica **130**:9-23, July, 1955.

A series of 71 cataract extractions on highly myopic eyes is reported and the complications listed. Four degrees of postoperative reopening (rupture) of the wound are recognized and are made manifest by these symptoms: 1. slight bleeding into the chamber only, 2. heavy bleeding into the chamber with visible gaping of the wound, 3. iris prolapse into the wound and 4. extraocular iris prolapse. Ruptures of the first degree occurred in 14 cases, of the third degree in 12 cases. Vitreous was lost visibly during the operation in three cases. Only one case of retinal detachment was noted. The advent of preplaced sclerocorneal sutures has made cataract extraction on highly myopic eyes considerably safer. (6 tables, 14 references) Peter C. Kronfeld.

Saubermann, G. **Results of acrylic lens implantations.** Ophthalmologica **129**:247-251, April-May, 1955.

Ridley's acrylic lens implant operation was performed on three patients with senile cataract and one patient with traumatic cataract. In all four cases a severe postoperative uveitis lasted from four to six weeks. Two months after surgery the uveitis had subsided and did not recur during the subsequent 16 months. A pupillary membrane formed and required discission in one case. The final vision was

good in all four cases. In the discussion Piper (Kiel, Germany) reported the results of 10 Ridley operations. In six cases the final vision was excellent; in three it was poor because of effects of the original (not the operative) trauma and in only one case could the poor end result be attributed to excessive scar tissue formation in front of the implant. Goldmann pointed out the possibility of the uveitis being caused by traces of the detergent used for sterilization of the implant.

Peter C. Kronfeld.

Smillie, John W. **Cataract surgery in megalocornea.** A.M.A. Arch. Ophth. **54**: 217-220, Aug., 1955.

The author differentiates magalocornea from buphthalmos. Megalocornea is defined as familial bilateral corneal enlargement without glaucoma occurring mostly in males. Cataract surgery is often complicated by vitreous loss. Two eyes are reported in which cataract extraction was done without complication. Intracapsular extraction with complete iridectomy was accomplished in one eye and attempted in the other. On the second eye the extraction was extracapsular because of rupture of the capsule but the final result was good. (1 table, 16 references)

G. S. Tyner.

11

RETINA AND VITREOUS

Boehme, G., and Bangerter, A. **Further contribution to the therapy of retinal detachment with hole in the macula.** Ophthalmologica **129**:297-302, April-May, 1955.

At the 1954 meeting of the Swiss Ophthalmological Society Bangerter first reported the successful closure of macular holes with retinal detachment by retrobulbar implants of human placental or amniotic tissue (cfr. Am. J. Ophth. 39: 463, 1955). He and his associates have had continued success with this method. The paper under review deals with an experimental approach to the question of the mechanisms involved in the retrobulbar implants. Human amniotic membrane was implanted retrobulbarly into normal rabbits. Subsequent ophthalmoscopic and histologic study revealed a localized chronic inflammatory process without demonstrable participation of the tunics of the eyeball. (4 figures, 4 references)

Peter C. Kronfeld.

Boudet, C. and Montagne, F. **Note on multiple tears of the retina appearing during surgery.** Arch. d'opht. **15**:383-394, 1955.

In a period of four months the authors observed eight cases of multiple obscure retinal tears. The cases are described in detail and illustrated with drawings in black and white and in color. All the patients were highly myopic and with one exception the detachments were spontaneous. With one exception the detachment involved the lower segment of the retina, and with two exceptions surgery led to healing. In four of the cases single tears were seen initially and in the remaining four no definite tears were seen prior to surgery. In all eight cases multiple tears were observed during or after coagulation. The authors insist, therefore, on the necessity of meticulous visual control during surgery. They speculate on the mechanism of the production of these multiple tears and suggest that they actually constitute multiple small peripheral disinsertions resulting from myopic degenerative changes. (8 figures, 5 references)

Phillips Thygeson.

Braley, A. E., and Ostler, H. B. **Statistics on 100 cases of retinal detachment surgery.** Iowa St. Med. Soc. J. **45**:473-476, Sept., 1955.

100 consecutive cases of retinal detach-

ment were treated by using a 1.5 mm. Walker pin with coagulation current as closely as possible to the tear. Other pins were inserted above and below the tear. A barrage, using a 0.5 mm. Kronfeld pin and a cutting current is placed posteriorly to the tear, and extends from the ora serrata, around the tear, and back to the ora serrata. The technique was successful in 72 percent of the phakic eyes and in 56 percent of the aphakic eyes. (1 figure, 4 tables) Irwin E. Gaynon.

Cavrot, E. **Retinal hemorrhage in the newborn.** Bull. Soc. belge de gyn. et d'obst. **25**:247-263, 1955.

Retinal hemorrhage is found in 33 to 44 percent of newborn infants. Although it is a harmless phenomenon it is a reliable measure of the vascular injury which is a manifestation of stress inherent in the process of parturition, of increased capillary fragility, and of the obstetrical factors in anoxia and trauma to the infant. The author's statistical study of 421 cases suggests that the incidence of retinal hemorrhage can be reduced to seven percent by the administration to the mother for five weeks before parturition of a nontoxic substance which improves the resistance of the vessels. It is probable that similar treatment will also reduce the incidence of intracranial bleeding. (11 tables, 21 references) F. H. Haessler.

Cremona, Alberto Carlos. **Retinoblastoma.** Arch. oftal. Buenos Aires **29**:337-348, June, 1954, **30**:73-81, Feb.-March, 1955, and **30**:109-128, April, 1955.

This detailed survey covers exhaustively the whole subject of retinoblastoma in its manifold aspects. Twenty-one case histories are briefly reported, in many of which the condition was bilateral; in one, it was clearly transmitted as a dominant trait. (111 references)
A. Urrets-Zavalia, Jr.

Crick, R. P. **Abnormal fundus reflexes and retinitis pigmentosa.** Brit. J. Ophth. **39**:312-316, May, 1955.

Association has been frequently reported between a tapetal reflex of the retina and retinitis pigmentosa, particularly in heterozygous females in a pedigree showing sex-linked retinitis pigmentosa. A nine-year-old girl is described who presented such an exaggerated retinal reflex and defective color vision. It was suggested that this might be a case of a heterozygous female in a pigmentosa family and a study was made of 28 of the 38 living members of the child's family. The results were completely negative; all seemed quite normal. Five years later the child developed the typical picture of retinitis pigmentosa, indicating that the early abnormal retinal reflex had indeed been a prodromal sign of retinitis pigmentosa. (5 figures, 7 references) Morris Kaplan.

Dekking, H. M. **Arteriovenous aneurysm of the retina with spontaneous regression.** Ophthalmologica **130**:113-115, Aug., 1955.

A typical case of arteriovenous racemose aneurysm in a nine-year-old girl is described and illustrated by excellent fundus photographs. During a period of two and one-half months a very decided regressive change occurred in the aneurysm. (3 figures) Peter C. Kronfeld.

Dellaporta, Angelos. **Artificial subchoroidal hemorrhage.** A.M.A. Arch. Opth. **54**:193-199, Aug., 1955.

The beneficial effect of scleral shortening operations for retinal detachment lies in the correction of the size discrepancy between the retina and the sclerochoroidal capsule. A temporary correction of this discrepancy was accomplished in experimental animals by injection of the animal's blood into the subchoroidal space. (11 figures, 3 references) G. S. Tyner.

Dufour, R., and Welter, S. **A case of retinal periarteritis associated with systemic vascular disease.** Ophthalmologica **129**:316-321, April-May, 1955.

The report concerns a middle-aged male patient whose systemic disease first manifested itself as a mild rheumatoid arthritis at the age of 37 years. A bundle-branch heart block occurred at the age of 45 years and cutaneous petechiae started to come and go at the age of 50 years, involving the eyelids, the neck and the trunk. Ophthalmologically, a bilateral retinal periarteritis with minimal choroidal involvement was first diagnosed at the age of 52 years and progressed slowly during a two-year period of observation. The periarteritis was characterized by multiple white cuff-like lesions around the retinal arterioles with few petechiae and hardly any venous involvement. In only a few places did the arteriolar lesions lead to complete obstruction of the vessel.

The patient was extremely sensitive to tuberculin. Treatment consisted of very cautious desensitization to tuberculin and various supportive measures. During a two-year period of observation the disease has progressed only very slightly. The authors are considering a benign form of periarteritis nodosa. (3 figures, 34 references) Peter C. Kronfeld.

Favre, M. **The different forms of vitreous detachment.** Ophthalmologica **129**: 290-296, April-May, 1955.

The author takes exception to Hruby's statement that "it is not possible at present to discern one form of vitreous detachment that is more frequently connected with retinal detachment than any other." This opinion stems from Hruby's method of examining the vitreous with a strong concave lens. This method, according to the present writer, does not give as correct a picture of the antero-superior boundary of the detached vitreous as does Goldmann's contact lens (preferably the three-mirrored one). With the latter method it is possible to distinguish three types of antero-superior attachment of the vitreous: the limiting membrane 1. bends smoothly backward, 2. it seems to hang straight down from its point of insertion into the retina, or 3. it bends smoothly forward. In the second form of attachment the vitreous may be expected to exert the greatest traction upon the retina. The state of the vitrous mass, solid or degenerated, and the state of the retina at and around the place of vitreous insertion are probably also of significance. Consideration of these factors may permit estimation of the likelihood of the formation of a retinal break. (6 figures, 5 references) Peter C. Kronfeld.

Frayer, William C. **Coats' disease.** A.M.A. Arch. Ophth. **54**:240-244, Aug., 1955.

One of the eyes of a 15-year-old girl and of a 16-months-old infant was enucleated because the clinical appearance of each eye suggested an intraocular tumor. In each case pathological examination disclosed a retinal separation resulting from subretinal hemorrhage. (6 figures, 10 references) G. S. Tyner.

González Santos, R. H., Castro, C. M., and Strezler, G. **Tromexan treatment of thrombosis of the retinal veins.** Arch. oftal. Buenos Aires **30**:149-153, April, 1955.

The ethyl ester of di-4-hydroxycoumarinyl acetic acid, tromexan, is a valuable anticoagulant which produces a rapid and short-lived prolongation of prothrombin time. In five men and four women where severe thrombosis of the central retinal vein, its main branches or the cilio-retinal veins existed, and whose age ranged from 36 to 72 years, the drug was administered orally in such doses as were found capable

of maintaining the prothrombin time between 30 and 40 percent (Quick's test). Usually, after an initial dose of 60 to 1,200 mg., 75 to 100 mg. were given at 12-hour intervals. In four cases the results were good, while in the remaining five it was of little or no avail. As treatment was started after a mean delay of 53 days (4 days to 6 months), at a time when the obstruction must have already been due in most cases to intimal proliferation, and as the improvement—when noticed—appeared only after a further term of 2 to 26 weeks, it is hard to see how the anticoagulant therapy can have been responsible for the ameliorations reported (2 tables, 3 references)

A. Urrets-Zavalia, Jr.

Hervouet, F., Baron, A., and Lenoir, A. **Pathologic anatomy of hesperanopic retinosis.** Arch. d'opht. **15**:263-284, 1955.

The authors call attention to the rarity of histologic examination in retinitis pigmentosa and to the fact that the few examinations made have been of eyes of subjects over 50 years of age. They report the examination of four globes. Two of these were enucleated because of secondary glaucoma; the other two came from a young man of 19 years who had died of an acute nephritis. These globes were studied with particular reference to 1. the degenerative changes in the visual cells; 2. the migration of pigment epithelial cells; and 3. the state of the vessels. The histopathologic findings are documented by 29 photomicrographs. The authors confirm the degenerative nature of the disease and conclude that progressive sclerosis of the retinal vessels is responsible for the secondary retinal changes. (31 figures)

P. Thygeson.

Lindsay, Alexander. **Retinal pigmentation due to choroidal melano-sarcoma with observations on congenital grouped pigmentation of the retina.** Brit. J. Ophth. **39**:114-118, Feb., 1955.

Two cases of choroidal melanosarcoma are presented. Grouped pigmentation of the detached retina is described, which the author feels is probably diagnostic of this disease. Three cases of congenital grouped pigmentation of the retina are then described and their distinguishing features brought out. The distribution of pigment as well as the size of the pigment particles are described with the characteristic paw-mark distribution in the congenital form, which is never seen with a malignant tumor. (6 figures, 5 references)

Lawrence L. Garner.

McWilliam, R. J. **Classification of angioid streaks.** Brit. J. Ophth. **39**:298-300, May, 1955.

Histologic study suggests that there are two entirely different types of angioid streaks: 1. those associated with degeneration of Bruch's membrane and systemic changes, and 2. streaks which are secondary to local lesions in the globe, such as retinal folds and choroidal detachments and in which Bruch's membrane is intact. (20 references) Morris Kaplan.

Paine, L. E. **Bilateral symmetrical retinal cysts.** Brit. J. Ophth. **39**:122-125, Feb., 1955.

A case of bilateral symmetrical retinal cysts is described. The theories of production of these lesions are enumerated and the unfavorable prognosis noted. (2 figures, 14 references)

Lawrence L. Garner.

Raimondo, N., and Leo, E. **Retrolental fibroplasia and oxygen therapy.** Boll. d'ocul. **34**:361-372, June, 1955.

The authors discuss retrolental fibroplasia and its possible relationship to oxygen therapy in premature infants. (15 references) William C. Caccamise.

Rathschueler, R., and Dufour, R. **Pathological events in high hyperopia.** Ophthal-

mologica **129**:327-330, April-May, 1955.

Two cases of retinitis proliferans and one case of retinal detachment in highly hyperopic eyes are reported. The question is raised whether the marked tortuosity of the retinal vessels in high hyperopia entails a predisposition to venous stasis and phlebitis. (12 references)

Peter C. Kronfeld.

Sbordone, G. **Surgical prophylaxis of retinal detachment.** Arch. di ottal. **59**:23-35, Jan.-Feb., 1955.

After reviewing the literature and the experience of the Ophthalmic Hospital in Naples, the author concludes that diathermic "blocking" of suspicious retinal areas is advisable as a prophylactic measure before actual detachment is observed. (27 references) John J. Stern.

Stallard, H. B. **Multiple islands of retinoblastoma. Incidence rate and time span of appearance.** Brit. J. Ophth. **39**:241-243, April, 1955.

43 patients who had been given radiation for retinoblastoma and who had been observed for as long as 25 years are described. The author was particularly interested in studying the time of appearance and the rate of growth of these recurrences, particularly in the remaining eye of patients. Multiple islands were noted in 26 patients after the initial detection and successful treatment of the neoplasm. It is interesting to note that the neoplasm could and did occur as early as two weeks after the initial treatment. The occurrence of these islands is noted much earlier when both eyes are effected by retinoblastoma than when the disease is unilateral. The author feels that unilateral cases of retinoblastoma can occur much later in life than the bilateral type. The average age of the patient when first seem was 15 months although of the entire group 21 were under one year of age. Cases of unilateral retinoblastoma beyond the age of 10 years are rare. Appearance of islands of retinoblastoma were not noted after the age of two years and one month in this series suggesting that careful follow-up studies are warranted for at least 18 months after initial therapy. The author advises monthly examinations until the child is 5 years old. (2 figures, 6 references) Lawrence L. Garner.

Streifler, M., and Landau, J. **Electric brain potentials in retinitis pigmentosa and familial hemeralopia.** Ophthalmologica **130**:116-127, Aug., 1955.

Systematic electroencephalographic studies were made on 25 patients with typical retinitis pigmentosa and on five of their relatives showing stationary hemeralopia without demonstrable fundus abnormality. The electroencephalograms in 14 of these 30 cases were abnormal and of a type commonly seen in lesions or functional disturbances of the structures surrounding the third ventricle and of the upper portion of the brain stem. These findings again suggest a relationship between retinitis pigmentosa and disorders of the hypothalamo-pituitary system. (3 figures, 1 table, 22 references)

Peter C. Kronfeld.

NEWS ITEMS

Edited by Donald J. Lyle, M.D.
601 Union Trust Building, Cincinnati 2

News items should reach the editor by the 12th of the month. For adequate publicity, notices of post-graduate courses, meetings, and so forth should be received at least three months in advance.

Announcements

Friedenwald Memorial Fund

The Association for Research in Ophthalmology announces the establishment of the Friedenwald Memorial Fund in honor of our great ophthalmologist. Its purpose will be to award meritorious research in ophthalmology and related sciences. Contributions may be sent to:

David G. Cogan, M.D., chairman of the committee, 243 Charles Street, Boston 14, Massachusetts; or to Bernard Becker, M.D., 640 South Kingshighway, St. Louis 10, Missouri; or to V. Everett Kinsey, Ph.D., Kresge Eye Institute, 690 Mullett Street, Detroit 26, Michigan.

Fellowships and assistantships

The College of Medicine, University of Florida, offers opportunities for graduate study in the basic medical sciences of anatomy, biochemistry, microbiology, pathology, pharmacology, and physiology. Applications are now being received and must be filed not later than March 1st. For further information and the necessary forms write to:

Office of the Dean
College of Medicine
University of Florida
Gainesville, Florida

Chicago clinical conference

The 1956 Clinical Conference sponsored by the Chicago Ophthalmological Society will be held at the Drake Hotel, Chicago, on February 10th and 11th. The 12th annual Gifford Memorial Lecture will be delivered by Dr. C. Wilbur Rucker of Rochester, Minnesota, at 5:30 p.m. on February 10th. The subject of his address will be "Alterations in caliber of the retinal vessels: Clinical and experimental observations."

Participating in the program will be: Dr. C. Wilbur Rucker, "Symposium on neuro-ophthalmology," Dr. Douglas Buchanan, Dr. Ben Lichtenstein, and Dr. Loyal Davis, Chicago; Dr. Rachmiel Levine, Chicago, "Symposium on diabetic retinopathy," Dr. Chester Coggeshall, Chicago, Dr. Hermann Burian, Iowa City. The fee for the conference is $35.00 which includes round-table luncheons.

Brooklyn scientific session

The fifth annual scientific session of the Brooklyn Eye and Ear Hospital Alumni Association will be held at the Brooklyn Eye and Ear Hospital on Saturday, April 7th. There will be a motion picture showing of "The surgical treatment of glaucoma: Goniotomy and goniopuncture in the treatment of congenital glaucoma," Dr. Harold G. Scheie, Philadelphia; and "Cataract in glaucoma," loaned through the courtesy of Dr. Wendell L. Hughes. The following papers of ophthalmic interest will be presented:

"Glaucoma in 1900," Dr. Ralph I. Lloyd; "Medical treatment of glaucoma," Dr. Willis S. Knighton; "Surgical management of glaucoma," Dr. Harold G. Scheie; "Gonioscopic significance in glaucoma surgery," Dr. Daniel Kravitz.

Highlights of ophthalmology

Dr. Benjamin F. Boyd, Professor of Ophthalmology, University of Panama School of Medicine, has started a new publication called *Highlights in Ophthalmology*. Not designed to become a journal or compete with them, *Highlights* will call attention to the outstanding contributions presented at important ophthalmic meetings as soon as the meeting is over, contributions that may be consulted at length later when they are published in the journals.

The inaugural number of *Highlights in Ophthalmology* covers the meeting of the American Academy of Ophthalmology and Otolaryngology held in Chicago October 9 to 14, 1955. The next congress to be covered will be the Pan-American Congress of Ophthalmology at Santiago, Chile, January 9th to 14th.

Highlights will also be published in Spanish under the title *Ultimos Sucesos Oftalmologicos* for Latin-American ophthalmologists.

The committee appointed by the Section of Ophthalmology of the American Medical Association to explore the problem of eye-banks in the United States is compiling information and all of the known eye-banks have been approached. It is possible that a number of eye-banks have been overlooked. If so, please communicate with: Dr. Derrick Vail, *Chairman*, 700 North Michigan Avenue, Chicago 11, Illinois.

To obtain *Highlights of Ophthalmology* for the Pan-American Congress send check or bank draft for one dollar and fifty cents to

Highlights of Ophthalmology
Via Espana No. 1
Box 1189
Panama, Republic of Panama

Michigan postgraduate conference

The Department of Ophthalmic Surgery, University of Michigan, Ann Arbor, will hold its annual spring postgraduate conference in ophthalmology on April 23rd, 24th, and 25th. Among the guest speakers will be: Dr. V. Everett Kinsey, Detroit; Dr. Albert N. Lemoine, Jr., Kansas City; Dr. Irving H. Leopold, Philadelphia; Dr. John S. McGavic, Bryn Mawr, Pennsylvania; and Dr. Hugh L. Ormsby, Toronto, Ontario. The registration fee is $50.00. Brochures of the program and further information may be obtained from:

The School of Postgraduate Medicine
University Hospital
Ann Arbor, Michigan

Societies

Brooklyn meeting

At the 136th regular meeting of the Brooklyn Ophthalmological Society, the following papers were presented: "Ophthalmological manifestations of lesions of the internal carotid artery," Dr. Albert W. Cook, with a discussion by Dr. Harold R. Merwarth; "Micro glasses: A new reading aid," Dr. Alfred Kestenbaum.

Carolinas meeting

The 1956 joint meeting of the North Carolina Society of Eye, Ear, Nose, and Throat and the South Carolina Society of Ophthalmology and Otolaryngology will be held on September 17th, 18th, and 19th at the George Vanderbilt Hotel, Asheville, North Carolina. The following ophthalmologists will participate in the program: Dr. Harold W. Brown, New York; Dr. Harold Scheie, Philadelphia; and Dr. Byron Smith, New York.

Nassau meeting

Dr. R. Townley Paton, New York, spoke on "Keratoplasty" at the November meeting of the Nassau Ophthalmological Society.

South Carolina officers

Recently elected officers of the South Carolina Society of Ophthalmology and Otolaryngology are: President, Dr. Norman Eaddy, Sumter; vice-president, Dr. J. H. Gressette, Orangeburg; secretary-treasurer, Dr. Roderick Macdonald, 330 East Main Street, Rock Hill.

NSPB meeting

At the open membership meeting of the National Society for the Prevention of Blindness, Dr. Jonathan T. Lanman, Assistant Professor of Pediatrics, New York University College of Medicine, spoke on "Control of oxygen to prevent retrolental fibroplasia in premature infants," and Dr. Jerry H. Jacobson, New York Eye and Ear Infirmary, discussed "Electrophysiology of the eye."

Venezuela officers

Newly elected officers of the Sociedad Venezolana de Oftalmologia are: President, Dr. R. A. Guerrero Pérez; vice-president, Dr. Pedro Pablo Morales; secretary general, Dr. Ramón Arrivillaga G.; corresponding secretary, Dr. Rodolfo Hernández M.; treasurer, Dr. Luis Alberto Parra Virla; directors, Dr. J. R. Aptiz Rhode and Dr. R. Sánchez Beaujon.

Egyptian meeting

The annual meeting of the Ophthalmological Society of Egypt will be held at the Memorial Ophthalmic Laboratory, Giza, Egypt, on Friday and Saturday, March 16th and 17th. The symposium of this meeting will be on "Corneal grafting."

Personals

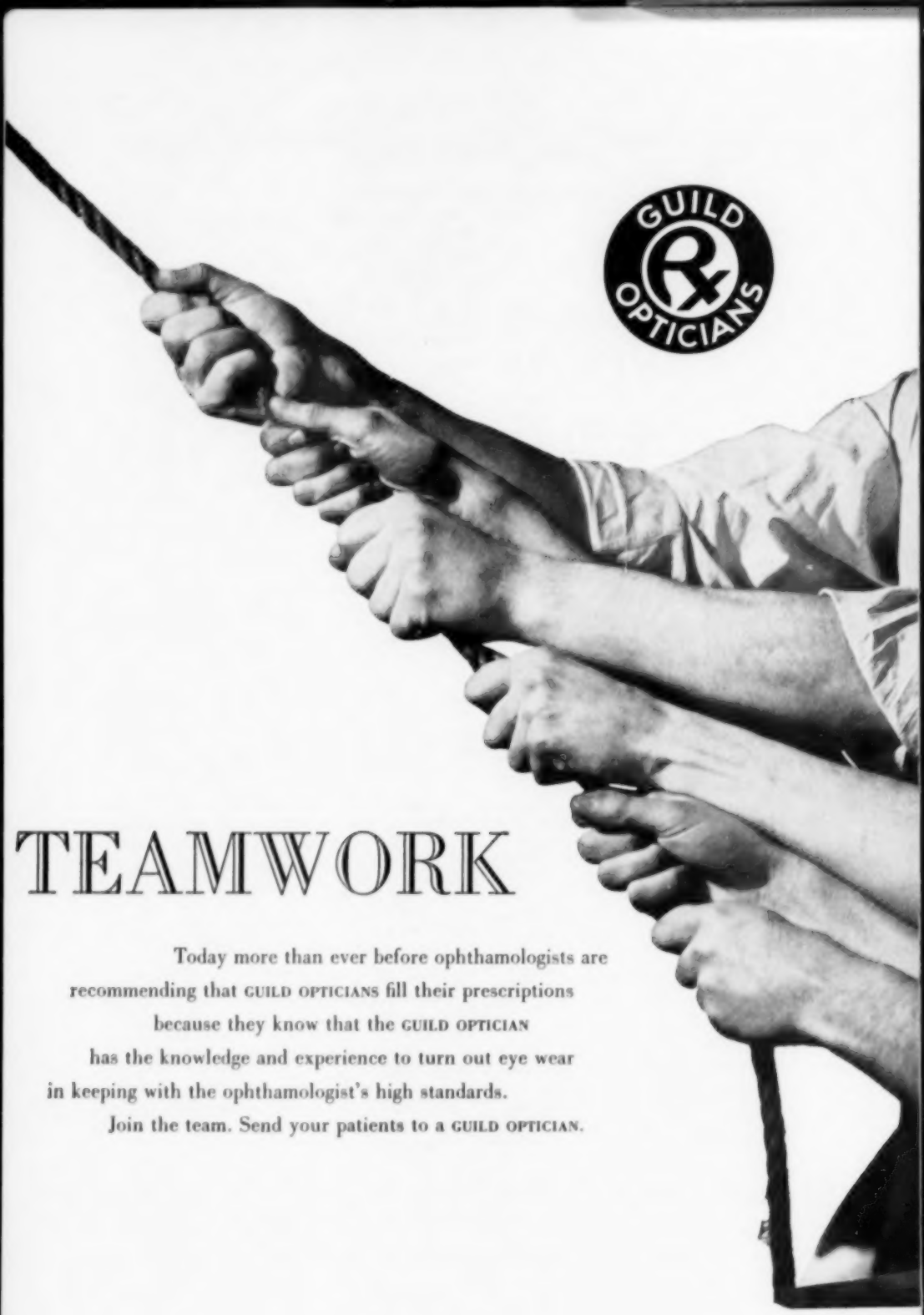
Dr. Frank B. Walsh, Baltimore, presented the 10th Francis I. Proctor Lecture on Friday evening, December 9, 1955, at San Francisco. The subject of Dr. Walsh's address was "The ocular signs of tumors involving the anterior visual pathways."

Dr. John R. Fair has been appointed Assistant Professor of Surgery and Chief of Ophthalmology at the Medical College of Georgia, Augusta, Georgia.

Dr. Alfred Cowan gave the 18th deSchweinitz Lecture at Philadelphia on November 17, 1955. The subject of Dr. Cowan's address was "Observations on ocular pigment and pigmentation."

Col. Victor A. Byrnes of the U. S. Air Force Medical Service has been awarded both the Legion of Merit and the Gorgas Medal for distinguished service of the Association of Military Surgeons for his excellent work on the effects of radiation on the human retina.

Mr. Frank Law, London, has been elected master of the Worshipful Company of Spectacle Makers.



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PRESCRIPTION OPTICIANS

The Sixth Annual Meeting of the New Orleans Academy of Ophthalmology will be held in New Orleans, Roosevelt Hotel, January 3-6, featuring "Diseases and Surgery of the Lens". The registration fee of $75.00 includes membership in the Academy for the year 1956. Hotel reservations should be made early by writing to the Roosevelt or 211 S. Saratoga St., New Orleans, La.

CHICAGO OPHTHALMOLOGICAL SOCIETY

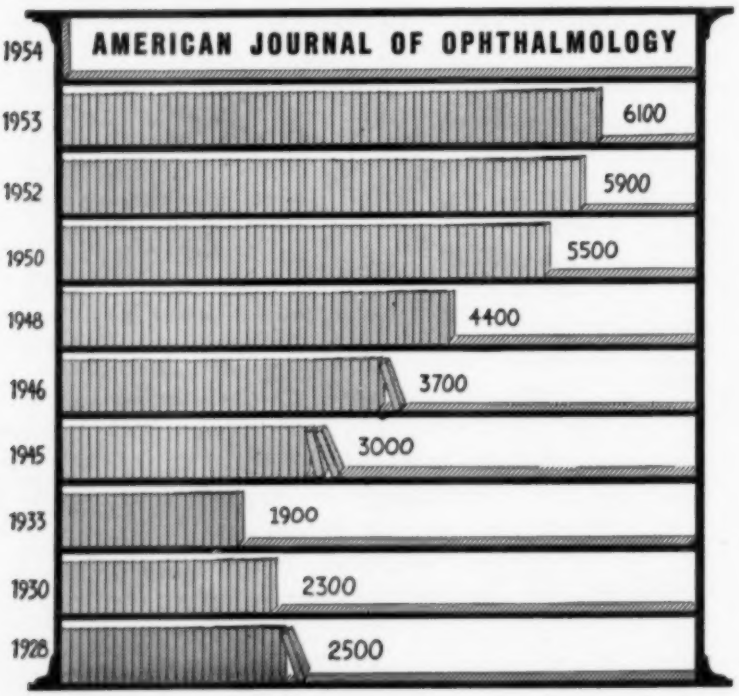
1956 Clinical Conference

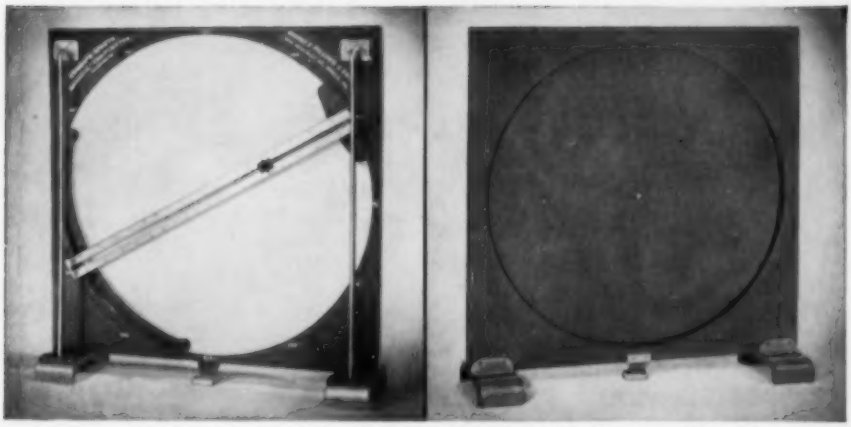
February 10-11, 1956 — **The Drake Hotel**

Friday A.M.	
Symposium on Neuro-ophthalmology	Douglas Buchanan, Chicago Ben Lichtenstein, Chicago Wilbur Rucker, Rochester, Minn. Loyal Davis, Chicago
Friday P.M.	
Problems in Diagnosis and Treatment of Strabismus.	Hermann Burian, Iowa City, Iowa
A New Autonomic Drug.	David Rosen, Kingston, Ont.
The Twelfth Annual Gifford Memorial Lecture	
Alterations in the Caliber of Retinal Vessels.	Wilbur Rucker, Rochester, Minn.
Saturday A.M.	
Symposium on Diabetic Retinopathy	Rachmiel Levine, Chicago Henry Ricketts, Chicago David Rosen, Kingston, Ont. Lester Coggeshall, Chicago
Saturday P.M.	
A New Scleral Shortening Operation	Ramon Castroviejo, New York, N.Y.
Clinical Application of Electroretinography	Hermann Burian, Iowa City, Iowa
Unusual Procedures in Cataract Extraction	Ramon Castroviejo, New York, N.Y.

Fee $35.00 (round table luncheons included)

Registrar: Miss Maud Fairbairn, 8 West Oak Street, Chicago 10, Ill.





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